SEXTANT

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Summer 1983
Issue No. 6

The Independent Magazine for the Entire Zenith Computer Community

The Assembly Language
Inside
a Spooler

Pascal
Elucidated

Take a Look
at Magnolia's
Invisible Disk

Two Windows
on the Future:
CP/M '83
and the
Faire

Who's on the Computer?
Passwords and Record-Keeping

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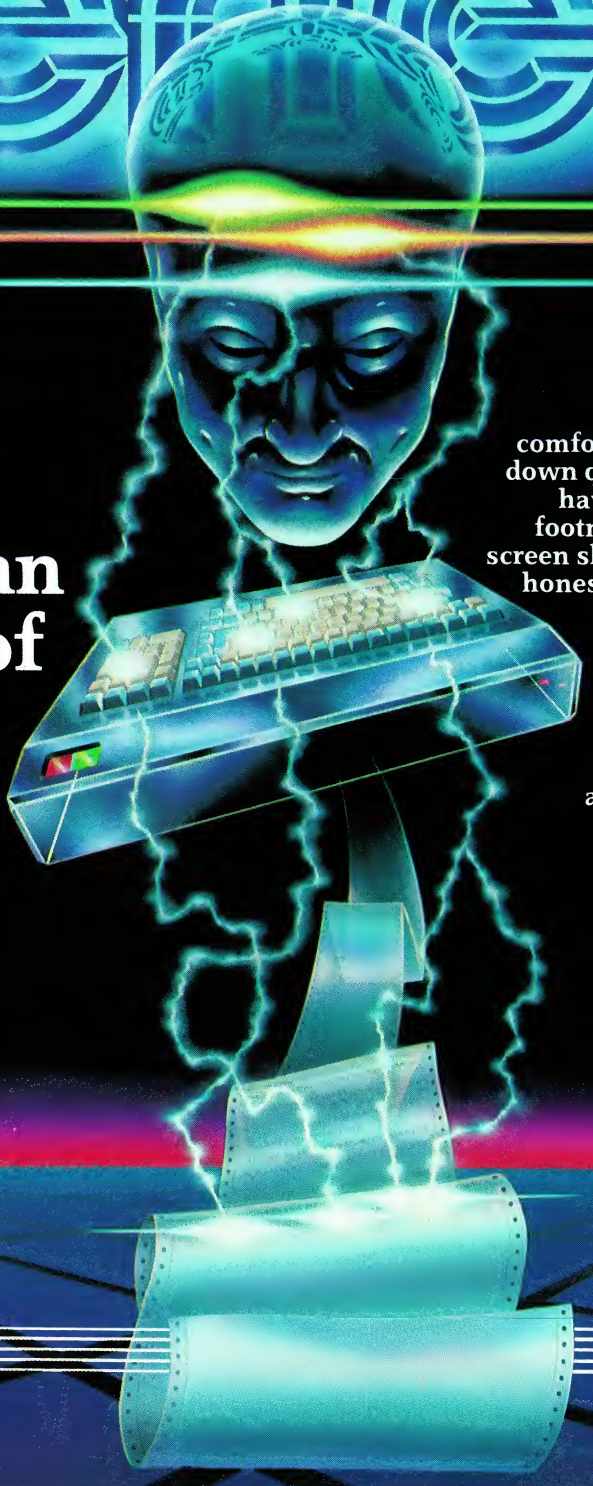
COMPUTER:	STANDARD DATA	IBM PERSONAL COMPUTER	DEC RAINBOW 100	WANG PROFESSIONAL COMPUTER	RADIO SHACK TRS-80 MODEL 16	APPLE III
MICROPROCESSORS:						
16-bit:	8088	8088	8088	8086	68000	—
8-bit:	8085	—	Z-80	Optional	Z-80	6502
MEMORY:						
Minimum:	128K	16K	64K	128K	128K	128K
Maximum:	768K	576K	256K	640K	512K	256K
DISC-LESS OPERATION	Yes	No	No	No	No	No
NETWORK READY	Yes	No	No	No	No	No
FLOPPY DISK STORAGE:						
Per Diskette:	320K	320K	400K	320K	1.2 MB	140K
Maximum Internal:	640K*	640K	1.6 MB	640K	2.4 MB	140K
EXPANSION SLOTS:	Five S-100 (four available)	Five (three available)	Three	**	One	Eight
I/O PORTS:						
Parallel:	1	—	—	1	1	—
Serial:	2	—	2	2	2	1
DISPLAY:						
Pixels:	640 x 225	640 x 200 (2 colors) 320 x 200 (4 colors)	800 x 240	**	640 x 200 (Monochrome)	560 x 192 (Monochrome)
Colors:	8	4	4	Optional	Not available	16
OPERATING SYSTEMS:	CP/M-85 Z-DOS (MS-DOS)	CP/M-86 IBM-DOS (MS-DOS) UCSD P-System	CP/M-86/80 MS-DOS	CP/M MS-DOS	RS 16-DOS TRS-DOS	Apple SOS

Information current as of 7/7/82. *External disk storage available soon. **Information not available at this time.

WordPerfect



A word processor should be an extension of your mind.

A good word processor should feel comfortable, and let you put your thoughts down quickly, almost effortlessly. It should have automatic everything, and include footnotes, merge, columns and math. The screen should be uncluttered and give you an honest view of your text without annoying codes.

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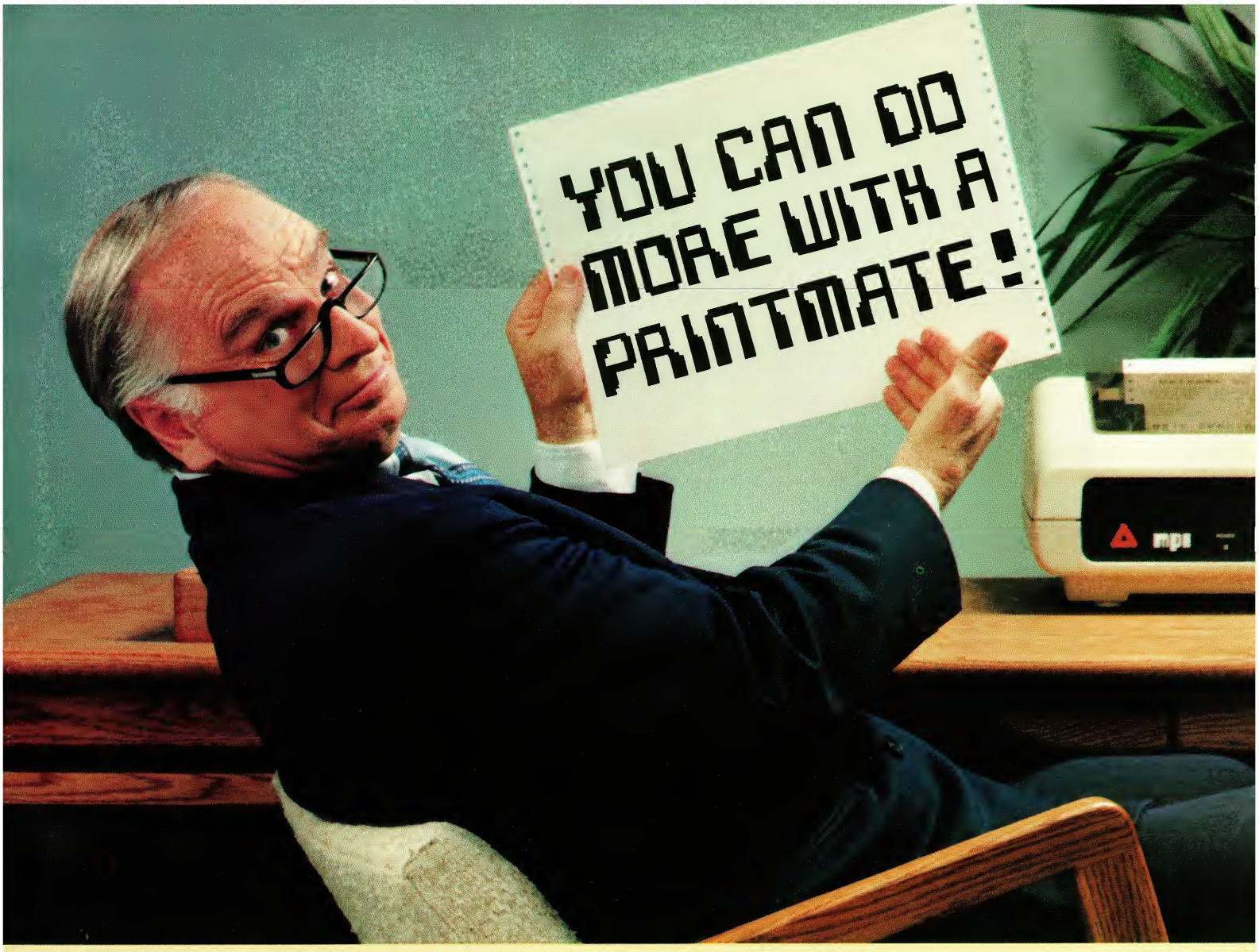

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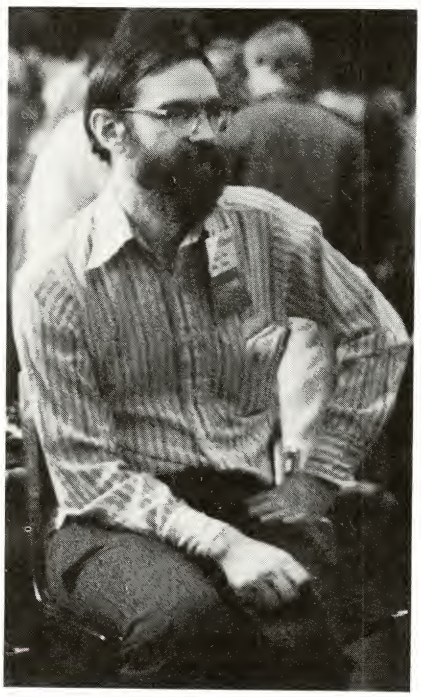
The Editorial Eye



Congratulations! Sharon Conaway has agreed to be your assistant publisher. She's reaffirmed her commitment to *Sextant*'s readers, advertisers, and staff. Among Sharon's first responsibilities in her new position has been helping me interview prospective new employees. We expect to have some fine new people on board in time for the Winter issue. That will give a couple of our current crew members a chance to take on new responsibilities here.

Sharon's also been keeping her eyes on a survey of *Sextant* subscribers conducted by McGraw-Hill Research at our request. The first exciting report we had from McGraw-Hill was that 84.7% of readers receiving questionnaires had completed and returned them. The significance of this in scientific terms is that there's only a 5% probability that the statistical results of the survey are off by more than 3.35 percentage points. Beyond that, this exceptionally high rate of response suggests *Sextant* subscribers are highly involved with the magazine—and highly cooperative with our efforts to continue improving *Sextant*. We appreciate the assistance of survey respondents in this task.

Several survey results illuminate the kinds of articles our readers like to see in *Sextant*. We learned about what hardware subscribers have, what software you're using, and what applications you're interested in.

Two questions dealt with the computers *Sextant* subscribers use or plan to buy in the next 18 months. The answers suggest 75% to 80% are

Focus on your system . . .

How to Use: Zenith/Heath Computers

Introducing—the guide to your microcomputer system! *How to Use: Zenith/Heath Computers* brings you useful information about your brand of computer. Written specifically for users of Heath/Zenith computers, Hal Glatzer's book is both an introduction to computing concepts for the novice and a reference tool for the expert.

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- *an exploration of software products compatible with your hardware*
- *reviews of peripheral products such as:*
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  print spoolers *modems*
  letter-quality and dot-matrix printers
- *a glossary, a list of suppliers and an index*

Clear presentations of technical information are supplemented with photographs and illustrations. This is not a complicated users' manual! Glatzer's guide is published by S-A Design Books, an independent publisher with experience in producing readable "how-to" books.

Order your copy of *Zenith/Heath Computers* today from *Sextant* for $19.95—including shipping and handling. If you're not completely satisfied with the book, just return it to us within 30 days for a full refund. Please indicate whether you would like us to ship the book by U.P.S. or Parcel Post, Special Handling. We can accept checks (in U.S. dollars payable on a U.S. bank, please), money orders, Visa or MasterCard. To order, fill out the order card above and mail it with your payment of $19.95 for each copy to Sextant Publishing Company, 716 E Street S.E., Washington DC 20003.

Circle #191 on Reader Service Card

interested in the H89, Z89, or Z90. One-fourth have an H8. About 30% expect to be using an H100 or Z100 within the next 18 months.

Three-quarters of subscribers either use assembly language now (57%) or plan to use it within the next 18 months. Half say the same about Pascal, with a third using or planning to use FORTRAN. Both of these languages are currently used by between one-fifth and one-fourth of our subscribers — Pascal's advantage is in terms of future interest. Nine-tenths of respondents admitted to using the less trendy, but ever-popular, BASIC. Forth and COBOL each attract the interest of between one-eighth and one-fifth of subscribers. LISP lags at 8%.

What types of software do our subscribers use or plan to buy in the next 18 months? The "Word Processing/Text Editor" category led in current use, followed by "Games/Entertainment." These two also attract significant interest as future purchases, exceeded only by "Data Base" and "Accounting." Our survey, in fact, failed to reveal a major software application which doesn't interest our readers. The least popular category was "Engineering"—with 22% using such software and 12% planning to buy within 18 months.

The strength of interest in such a diversity of software applications is perhaps related to the fact that 70% of survey respondents described their involvement with personal computers as both hobby and professional/business. We also asked: "Do you or does your company own a personal computer?" "I own," said 90%, while 61% replied: "My company owns." The leading description of occupation was "Engineer/Scientist" (32%), followed by "Business Owner/Manager," "Military," and "Programmer/Analyst" in the 10% to 13% range.

Prospective *Sextant* authors may also be interested in another question we asked: "Which of the following actions have you taken after reading an article in *Sextant*?" Survey respondents replied they'd implemented a hardware modification (23%), tried a new programming language or technique (32%), run a listed program (40%), purchased a product read about (52%), discussed an article with someone (69%), or contacted a supplier for more information on a product (76%). In all, 97% indicated they'd taken some action after reading a *Sextant* article.

A valuable tool in judging reader response is the Reader Service Card (facing page 82 in this issue). Two articles in the Spring *Sextant* were especially popular. Jim Hassall concentrated on fundamental input and output functions in "An Introduction to CP/M for Assembly Language Programmers." Herbert Friedman focused on disk structure in "Understanding HDOS." These point up the consistent popularity of *Sextant*'s most technical articles.

In March and April I had two other opportunities to hear from *Sextant* readers: the West Coast Computer Faire and the Trenton Computer Festival. I picked up some valuable suggestions in both San Francisco and New Jersey.

We welcome letters pointing out specific subjects you'd like to see covered in *Sextant*. This issue we have articles dealing with Pascal, assembly language, and FORTRAN. Plus information on more than one product of particular interest to H/Z89 users. There's a BASIC program you may find entertaining as well as illuminating. We have two reports which cast light on future software offerings.

I believe my job as an editor is to give you not only what you'd like to be reading, but also what you should be reading. The better I get to know you, the better I can do both jobs.

Charles Floto

SEXTANT

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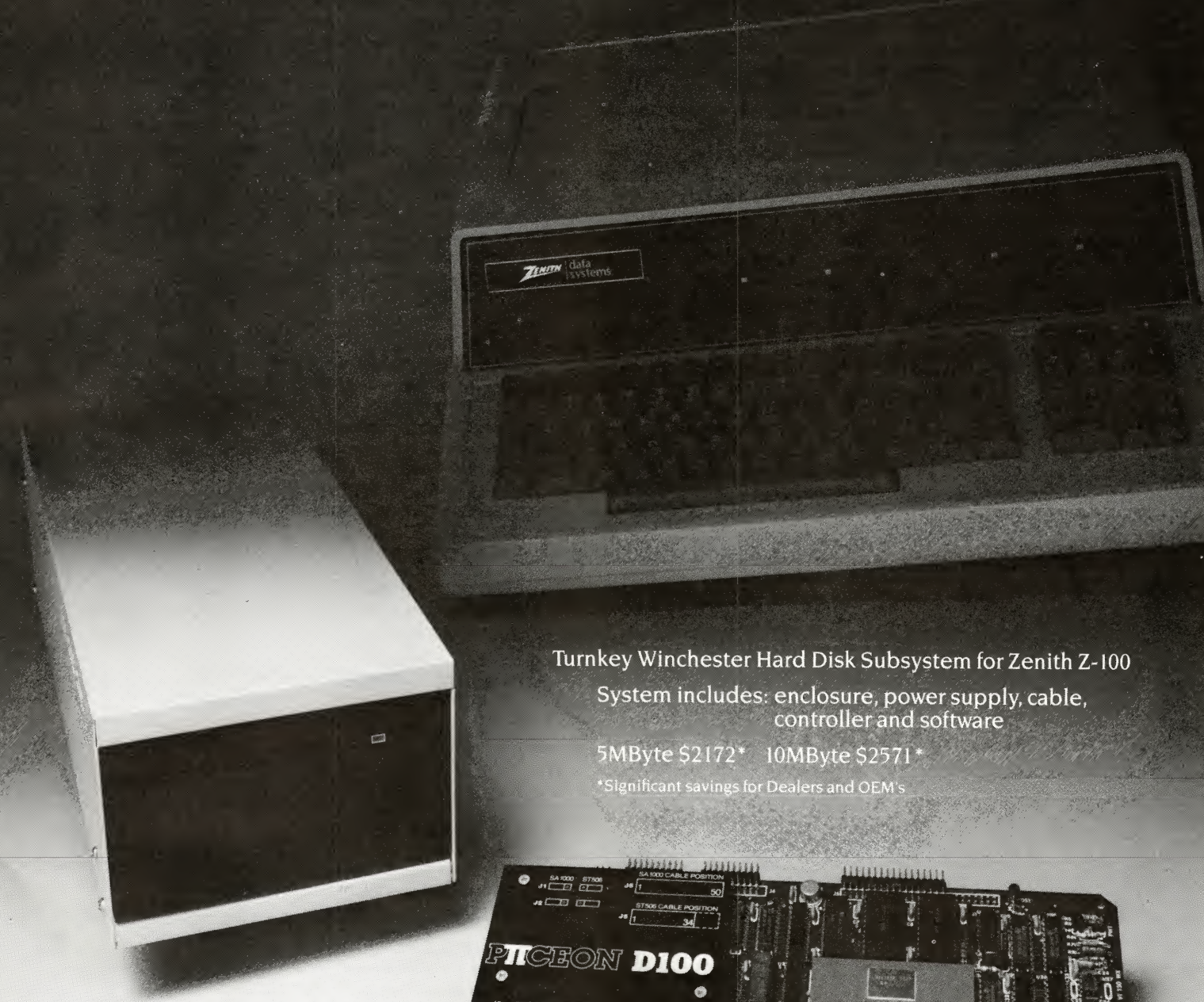
Think Hard!



Turnkey Winchester Hard Disk Subsystem for Zenith Z-100

System includes: enclosure, power supply, cable, controller and software

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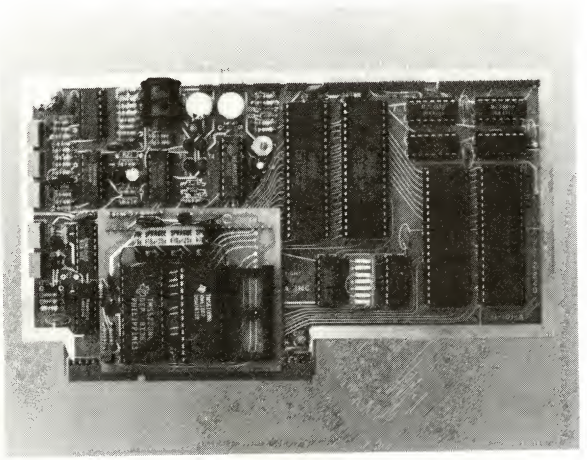

Photo Courtesy of Artra, Inc.

In the movie 2001, the computer that ran everything was called HAL. If Reuel Launey of Arta, Inc., has his way, you'll run your home with the aid of a system named Waldo. Running on your Heath/Zenith computer, Waldo may not be as famous as HAL yet, but he speaks your language.

45

All right, so fortune telling is a superstitious relic. Like tales of witches stirring cauldrons, it's totally out of place in the modern age. But we've automated everything else, so why not automate superstition, too? You can use your Heath/Zenith computer to cook up suitable fortunes for friend and foe alike—seasoned with a dash of humor, to taste.

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Features

CP/M '83 11
Frederick Zimmerman
It was only a matter of time. After eight years on the market, and having the largest pool of microcomputer software running under it, the CP/M operating system had to have a computer conference all to itself. It happened in January in San Francisco. *Sextant*'s Fred Zimmerman was there to report on things.

Pascal Elucidated 27
Hugh Kenner
Are your BASIC programs "boneless?" Are they shaped like pasta? Do you yearn for Structure in your programming life? Do you, though, shrink from attempting Pascal because its price is out of reach? Fret not, there is Lucidata Pascal to give you the Grand Tour at a budget price. Or are you just reluctant to leave the safe harbor of BASIC for the Alpine heights of Pascal's austere purity? Again, fret no longer—here you have a trail guide to help you along the way.

Squeeze More Disk Space Out of HDOS 33
Charles E. Cohn
Only one disk drive with your H8 or H/Z89? Not much disk space left? Don't care to spend money to add another drive? Stand-alone operation may tide you over.

Taking a Look at Magnolia's Invisible Disk 35
Hal Glatzer
You can always use more disk space. Your programs can always use faster disk systems, particularly those that have to go back and forth to disk to read and write data all the time. So how about both for the same price? A "disk drive" with the I/O speed of RAM? Magnolia Microsystems calls it their "Invisible Disk." Reviewed here, it's available for use under both CP/M and HDOS.

Passwords and Record-Keeping: One School's Solution 37
James A. Ingram
Computers are notorious these days for giant, complex security systems—designed to prevent access to the data by any except Authorized Personnel (and teenage hackers). Well, maybe your needs are more modest: presenting a password for access; and keeping records of who used the system, when, and for how long. If so, a Nebraska high school is using a program you might want to look at.

Waldo and Artra, Inc. 45
Frederick Zimmerman

Issue No. 6, Summer 1983

Letting Lindley Systems Drive Your Epson Printer 55
Joseph Gonzáles
Dot-matrix printers are really neat things. And a lot of Heath/Zenith users like the Epson. But you can't just plug a printer into a computer like plugging your tape deck into an amplifier. The software gets complicated. Lindley Systems is one supplier offering products to make things easier. Here's a report.

Avoid Unnecessary FORTRAN Input 61
Ralston W. Barnard
One of the reasons you bought your H11, H8, H/Z89, or H/Z100 was so you wouldn't have to do a lot of dull, tedious, repetitious stuff—your computer would do it for you. Yes? So there you sit, typing in redundant device and file names. So, here's a program to palm off some of your computer work onto your computer.

At the Faire: The Heath/Zenith Community 65
Frederick Zimmerman

Automatic Key-Repeat for Your '19 or '89 79
Kirk L. Thompson
You're typing at your H/Z19 or H/Z89 keyboard. You want a line of uppercase X's. You have to hold down the shift, the "X," and the REPEAT key. That takes *three* fingers! R. P. Enterprises offers a repeat board to make things easier for those of us who are still two-fingered typists. The rest of you should find things easier, too.

Program Some Improbable Prognostications 81
Edward A. Byrnes

Inside a Spooler 85
A. E. Dessler
No one likes to hold up work at a terminal sitting around waiting while something is printed out. So you get a spooler which takes care of the printing while you're doing whatever it is you're doing on the computer. Have you ever wondered how the spooler lets your computer do two things at the same time? Or have you thought about writing one yourself? Either way, take a look.

The Z29 Terminal 97
Charles Floto

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Cover Photo by William H. DuBay

Photo by Elizabeth Saxon

65

In a ritual as indicative of the onset of Spring as the return of the swallows to the Mission San Juan Capistrano, personal computerists returned to San Francisco's Civic Auditorium and underground Brooks Hall for this year's West Coast Computer Faire. Responding to primaeval urges for gregarious endeavor (and mutual profit), Heath/Zenith, the independent suppliers, and, yes, *Sextant*, were among those following the age-old migration routes from places as exotic as Benton Harbor, Michigan, or Washington, D. C., to microcomputerdom's annual three-day nesting ground in the City on the Bay.

Photo Courtesy of Zenith Data Systems

97

You love your H/Z19 terminal. But can you put it in your lap with your feet up on your desk as you call up the HUG Bulletin Board? The '19's new successor is the Z29, with detachable keyboard and other amenities. Set it in your lap, sit back, and conduct business in a more relaxed mode.

Letters

My apologies . . . for going off on a tangent after receiving your offer to purchase *How to Use: Zenith/Heath Computers* via *Buss*. I've already purchased a copy, but I thought you might be interested to know that *How to. . .* is the first book about "our" computers only if you include Zenith. Otherwise the honor (as far as I know) goes to *H-8 Programming for Beginners* by Santore, Inman, and Albrecht (dilithium Press, 1980).

John Toppin
Lawrence, KS

[dilithium Press, 11000 SW 11th St., Suite E, Beaverton, OR 97005]

I have followed with interest and delight the articles by Hugh Kenner on what amounts to highly capable budget word processing [*Sextant*, Spring, Fall 1982]. There is, of course, the other aspect that is not usually so 'budget,' the hardware. That is what this letter is really all about.

First, the printer: I don't care what anybody says, dot-matrix printers do not produce letter-quality print unless there is some expensive variety that I haven't seen yet (entirely possible). The best bet is the Smith-Corona TP-I now on the market, advertised at less than $600 discount. It is slow but at a computed rate of 120 words per minute, is considerably faster than most good typists. During my one typing course in high school I computed out at -10, that's right, minus ten words per minute. At the price, the TP-I certainly is more affordable than the $1,500 to $2,500 that you see advertised for the next higher level of speed and gimmicks.

Next, the interface: I purchased an H89CTI-B parallel printer interface ($54.95) and GP2: HDOS device driver ($10) from D. M. Brockman, FBE Research, P.O. Box 68234, Seattle, WA 98168, (206) 246-9815 (evenings). Mr. Brockman and I discovered a grounding problem, the solution to which appears below. Not solving the grounding problem results in garbage. Mr. Brockman proved to be extremely helpful and, in fact, wrote the GP2: device driver specifically for the TP-I, allowing the margin and tab sets as specified in the TP-I manual.

Here is how I "corrected" the grounding problem:

Dave Edwards of Smith-Corona Technical Service in Cortland, New York, had very generously supplied me with circuit information back when I first seriously started thinking about how to interface the TP-I to my H89.

Checked ground resistance between printer and H89. The resistance was about 10K ohms. Removed the TP-I cover, a difficult operation. Removed the parallel connector. Verified that all grounds, signal and chassis, were the same electrically. Verified that the line to pin 12 (white) and the line to pin 17 (black) were the same ground. The line to pin 17 is actually a shield ground and is bare for about an inch from the connector. The H89CTI comes with a 6-foot ribbon cable. Alternating wires are grounded on the computer side, so I ran a jumper from pin 30, one of the ground lines, to the bare wire that goes to pin 17 and soldered it. Hooked all the cables up and again verified grounding. This time there was zero resistance between signal and chassis grounds from printer to H89. Reassembled. Ran perfectly.

Before being congratulated or castigated for this feat of technical derring do I must admit to being talked through it, over the telephone, by Mr. Brockman of FBE.

The bottom line is that the H89 owner can get into word processing with software (PIE and TEXT 4.0), interface, and printer for about $750.

Joseph R. Bobbitt III
Upper Montclair, NJ

The plastic wrapper for your magazine is a great idea; keep it up.

I'm glad to get a magazine that hasn't been mangled somehow by our postal service.

James J. Quinn
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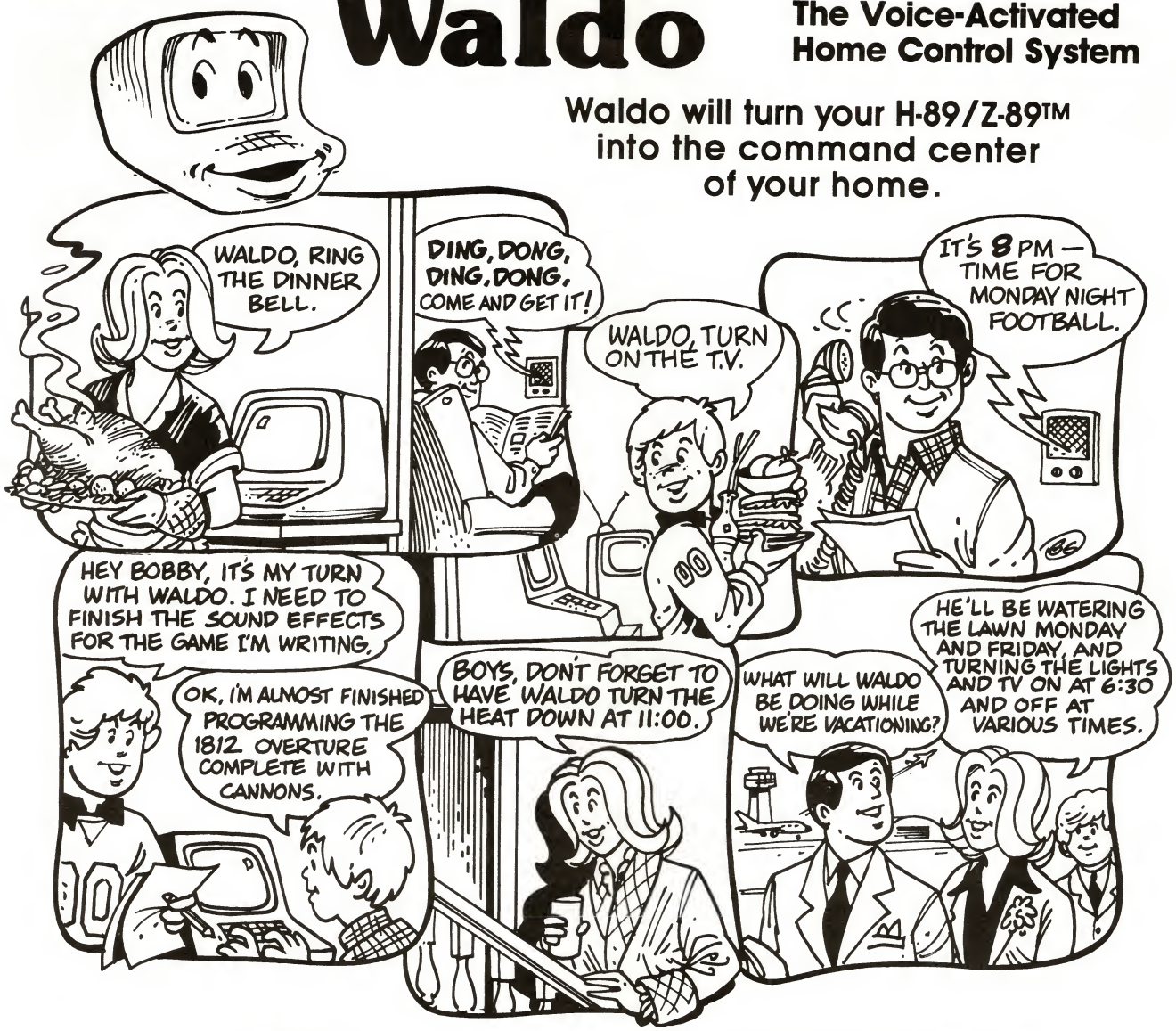
WALDO, RING THE DINNER BELL.
DING, DONG, DING, DONG, COME AND GET IT!
WALDO, TURN ON THE T.V.
IT'S 8 PM — TIME FOR MONDAY NIGHT FOOTBALL.
HEY BOBBY, IT'S MY TURN WITH WALDO. I NEED TO FINISH THE SOUND EFFECTS FOR THE GAME I'M WRITING.
OK, I'M ALMOST FINISHED PROGRAMMING THE 1812 OVERTURE COMPLETE WITH CANNONS.
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WHAT WILL WALDO BE DOING WHILE WE'RE VACATIONING?
HE'LL BE WATERING THE LAWN MONDAY AND FRIDAY, AND TURNING THE LIGHTS AND TV ON AT 6:30 AND OFF AT VARIOUS TIMES.

Waldo is:

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- a voice link between you and your computer
- a control link between your computer and your home
- the heart of a system that will be expanded with a variety of plug-in components and new software

Waldo has as standard features:

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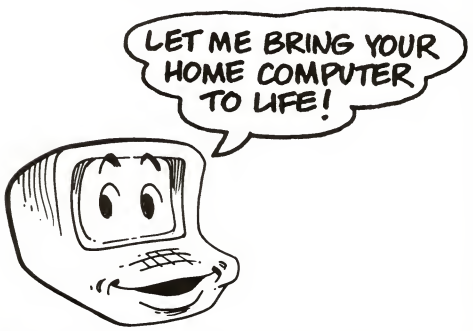
- BSR X-10 home control interface
- stereo music and vast and varied sound effect capabilities
- a disc with a full library of application programs incuding the HOUSEMASTER voice/time control program depicted above
- a complete operating manual



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- 5 1/0 slots
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- Runs all Heath/Zenith software without modification
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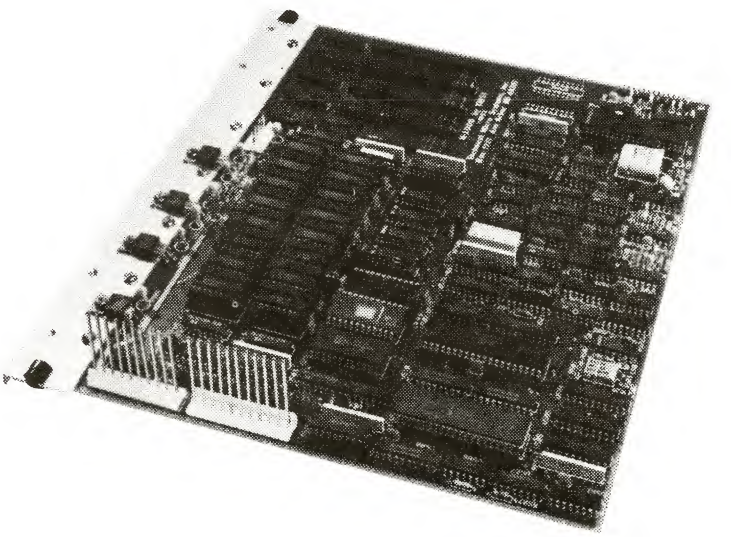

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Circle #173 on Reader Service Card

CP/M '83

Its seminars, exhibits, and technical discussions clarified the future of the popular disk operating system.

Frederick Zimmerman

Applications programs written for the CP/M microcomputer operating system are "portable." Human beings are portable, too. Put those two facts together and you have CP/M '83, the first-ever CP/M users' conference, held January 21-23 at the Moscone Center in San Francisco. I was there to report for *Sextant* and *Buss: The Independent Newsletter of Heath Co. Computers*.

The portable humans packed the Moscone Center's vast exhibition hall almost to the bursting point for a chance to see more than two hundred exhibitors showing hardware and software products compatible with CP/M. The vendors had good reason to come in such numbers; estimates of attendance ranged from 26,400 to 48,000. There were many fascinating pieces of software on display, and *they* were portable, too. (On payment of an appropriate sum...)

Of course, the software was also "portable" in a different sense of the word. The programs on display at CP/M '83 were all written for the CP/M operating system, which means that almost any CP/M program can run on a computer which uses CP/M. That's a wide variety—it includes, for example, computers made by Morrow Designs, Digital Equipment Corporation, Osborne, CompuPro, NCR, and Heath/Zenith. In practical terms, if you have CP/M on your H8, H/Z89, or H/Z100, you can buy a program that was written for CP/M on a different machine altogether, and (if you can get it on a disk format which allows you to load it) you *know* it will run on your machine. And there are literally *thousands* of CP/M applications programs.

CP/M, or the Control Program/Microprocessors, consists of three modules: the console command processor (CCP); the basic disk operating system (BDOS); and the basic input/output system (BIOS). The BIOS can easily be tailored to fit any hardware manufacturer's particular system configuration. Some computer manufacturers have found this a sensible idea. Although several companies—Apple, Tandy, Heath—have successfully created proprietary operating systems with a pool of applications software, many hardware manufacturers have preferred not to undertake that burden. Digital Research, to its credit, took the opportunity to provide a product which created a widely accessible software pool—and Digital Research got there *first*. That's why CP/M is now the closest thing there is to an "industry standard" operating system.

According to our Reader Service Cards, more than 40% of *Sextant* readers already have CP/M, and more than 80% of you have hardware which could, with a little investment, run CP/M. We hope that you'll enjoy an article which combines a "general-interest" look at the world of CP/M with a look at *your* special interest: information about CP/M for Heath/Zenith computer users.

CP/M Public Domain Software

Robert Todd acts as a clearinghouse for Heath-format CP/M software from SIGM, the Special Interest Group for Microcomputers of the Amateur Computer Society of New Jersey, and the CP/M Users' Group, CPMUG. A catalog is available on a double-sided Heath-format 5¼" CP/M disk for $6; specify 40- or 80-track, hard- or soft-sectored. The same catalog is available as a set of three single-sided 40-track 5¼" disks for $16; specify hard- or soft-sectored. Further details are provided in issue 64 of *Buss: The Independent Newsletter of Heath Co. Computers.*

Robert H. Todd, Jr.
1121 Briarwood
Bensalem, PA 19020

There's a lot to tell you about. Some of the biggest companies in the microcomputer industry were at CP/M '83. Among them: the Osborne Computer Company, with the first portable computer, the Osborne I; Ashton-Tate, with its popular data base manager, dBASE II; Perfect Software, with its line of applications programs; Digital Equipment Corporation, moving down to the *micro*computer market with a personal computer for professionals, the Rainbow 100; VisiCorp, producer of VisiCalc, showing VisiON, its forthcoming integrated Operating eNvironment product; and, of course, Digital Research.

Digital Research, Inc. (DRI) sponsored CP/M '83. (The actual organizational work was done by Northeast Expositions of Boston.) Not surprisingly, DRI had a substantial presence at the show. A CP/M exhibition booth was located directly inside the main entrance to the exhibition hall. Most of the conference seminars and workshops included at least one speaker from DRI. And, perhaps best of all from Digital Research's point of view, nearly every sign and advertisement in the huge Moscone Center blazoned the name of DRI's chief product, CP/M.

Digital Research meets the (trade) press

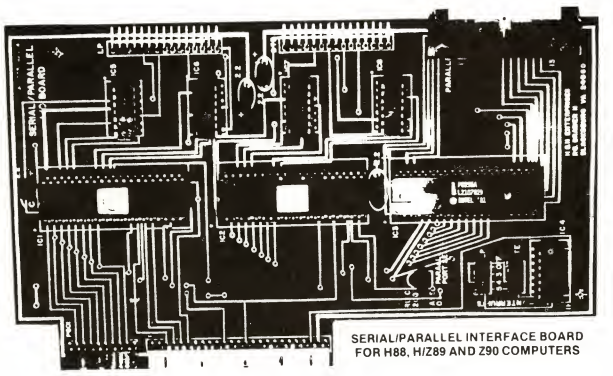
The first item on *Sextant*'s agenda was a visit to Digital Research's press session on Thursday, the day before the conference started. Top DRI executives spent five hours briefing members of the microcomputing press about Digital Research's current and future activities. (The public relations firm of Franson &

Associates coordinated events.) Speakers included Gordon Eubanks, vice president and general manager of the Commercial Systems Division of DRI; Jackie Pakarinen, director of engineering for the Operating Systems "Strategic Business Center" (SBC), i.e., division; Ralph Gilman, a senior vice president of an independent market research firm, InfoCorp; Allen Beebe, director of engineering for the Languages SBC; Fred Langhorst, director of graphics development; John Rowley, chief operating officer; and star attraction Gary Kildall, founder, president, and chief executive officer of Digital Research.

Their audience was rather interesting in its own right, if you happen to read any of the general-interest microcomputing magazines. Most of the major magazines sent representatives to the DRI seminar. Among others, there were people from *Popular Computing*, *Personal Computing*, *Portable Computer*, *CP/M Users' Guide*, *ISO World*, and *Byte*. It was a knowledgeable group.

Gordon Eubanks began his remarks in a characteristically professorial way: he defined his terms. His definition of a "personal computer" was operational: "a microcomputer designed for use by a person rather than an organization." The antonym, he said, would be "organizational computer."

Eubanks launched into his speech with a discussion of the "roots of the microcomputer revolution." He noted that the rapid development of microprocessor and floppy disk technology contributed to the origin of microcomputers. He gave equal credit, though, to what he called an "unsung hero": the PL/M compiler developed by Gary Kildall while he was working as a consultant for Intel in the early Seventies. Note: the "hero" in this case is not Kildall himself, who has had his share of recognition; the hero is the PL/M compiler. PL/I is a powerful and complex mainframe language, and Eubanks thinks bringing it down to the microcomputer level "gave micros a lot of credibility." The PL/M compiler, Eubanks argued, "was one of the breakpoints in technology."



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FOR H88, H/Z89 AND Z90 COMPUTERS

Here is the interface board that your 2 or 4 MHz H/Z 88/89/90 has been waiting for. Replacing the H88-3 serial board, KC1222 gives you the standard serial ports PLUS three bi-directional user-programmable parallel ports. These parallel ports may be used not only for lower cost parallel printers, but also real time clocks, home security/control, UVPROM programmers, etc. By combining serial and parallel I/O capabilities on a single card, only one bus slot is used - a very important consideration for future system expansion. Kit KC1222 has all items necessary for two serial and three parallel ports, including all cables and hardware. Kit KP1222 has the same items less serial chips, cables and hardware.

PRINTER DRIVERS. The Epson MX-80, — 100, C. Itoh 8510, NEC 8023A and Okidata Microline series are presently supported under HDOS and Heath's CP/M. The Smith Corona TP-1 and others are being added. Source code is included on 5¼" hard sectored disk

PRINTER PACKAGES. We are offering a package deal with the C. Itoh Prowriter. It features bi-directional logic seeking print at 120 characters per second, dot graphics, multiple print and character fonts, friction feed and adjustable tractors. The C. Itoh styling matches the '89 styling. We setup the printer and ship it to you checked out - it will work the first time you use it. The package has printer, interconnect cable and software. Gone are the worries about making a cable, setting the proper switches, etc.

HOW TO ORDER

KC1222 complete kit	$128.00	**HDOS** or **CP/M** software, each	$ 20.00
KP1222 parallel only version	97.00	**Prowriter Printer Package**	485.00
PC1222A bare board	48.50	(Please specify software desired)	

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Three further factors accelerated the microcomputer revolution: the fact that microprocessor technology was available to a wide range of computer manufacturers; the steady improvement of peripherals technology (terminals, printers, monitors, etc.); and the work of the independent software vendors. Eubanks implied that the existence of competing microprocessor technologies allowed the existence of today's two-tier micro technology market. One tier consists of large semiconductor companies—such as Intel, Motorola, Zilog, etc.—who make the microprocessors themselves. The other tier consists of the independent manufacturers—Apple, Zenith, etc.—who create the micro*computers*. This two-tier system has encouraged aggressive competition in bringing customer-oriented machines to market.

Eubanks told a story to illustrate the importance of peripherals technology in the growth of microcomputing. "In 1975 I was a student of Gary Kildall. He called me up one day and said, 'I can get you a used terminal, that may or may not work, for $700.'" Eubanks leapt at this terrific deal—and, he added, got a useful terminal for his money. But he pointed out that "today, if you told me" what Gary Kildall said in 1975, "I'd say you were crazy." More capable terminals are available *new* for roughly the same price.

Finally, if you have ever used a word processor or a spreadsheet program, you already understand how important the independent software vendors have been to the microcomputer industry. It's often said that hardware sales are software-driven: people buy computers because they can perform specific useful applications. The most important applications programs have been created by independent software vendors (ISVs). Digital Research has especially strong reason to be grateful to the ISVs, since the large pool of ISV-produced CP/M applications software is one of DRI's strongest selling points for its operating system.

Eubanks on the microcomputing industry

One of the central issues in any discussion of microcomputer hardware and software today is the question, "8–bit or 16–bit?" Early generations of microcomputers processed data eight bits at a time, whereas most new computers process data in chunks of 16 bits. Eubanks disparaged claims that 16–bit programs have a significant advantage in speed. "That's a very secondary issue; one of the worst things you can do is to buy a 16–bit computer and think it'll be faster. That is *wrong*."

The new technology has some advantages, Eubanks noted, particularly in allowing the use of larger amounts of random-access memory (RAM). This, Eubanks said, is a "huge" advantage. Typical 8–bit processors have 16 address lines; that is, they can address 2^{16} locations in RAM, or 64K; 16–bit processors have at least 20 address lines, so they can address at least 2^{20} bytes of RAM.

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Software For Heath/Zenith Computers

Text Processor — New Release Version 4.0 — H8, H/Z-89, H/Z-100 Versions

Text Processor is a screen oriented text editor designed especially for the H19/H89 terminal. The top twenty-four lines of the screen are used as a window into your text file. "What you see is what you get!" Each time you enter any keystroke, its effect is immediately displayed. The twenty-fifth line is used as a "COMMAND MENU". The keypad and function keys control most commands. Text Processor is designed to be easy to use, yet includes a full complement of powerful commands for fast and efficient entering and editing of text or programs. Text automatically wraps to the next line when the margin is reached. Built-in HELP facility and complete documentation are included. This editor even has an OOPS key to undo your mistakes! Control characters and escape sequences can also be inserted into your text for control of your printer features. New features include automatic backup of input file, macro command buffer, command repeat key (repeats up to 32,000 times), back-tab, line number in 25th line, default margin settings, and more.

For HDOS 2.0 or higher (40K memory advised), H19/H89 ..... $59.95
For CP/M 2.x or higher (40K memory advised), H19/H89 ..... $59.95
For CP/M-85 .....
For ZDOS $59.95
For ZDOS And CP/M-85 ..... $99.95

Touch Typist 2 — New Version

Touch Typist was written for the Heath/Zenith computer users who use the old hunt-and-peck method of typing. And, for those who already know how to touch-type, Touch Typist has practice lessons to help improve your speed and accuracy. Touch Typist consists of a series of lessons which you can practice at your own pace. This program combines time tested techniques of teaching typing with the instant feedback only possible with a personal computer. See the Software Review in the January 1982 issue of Kilobaud/MICROCOMPUTING magazine for a complete review of this computer-aided instruction program.

For HDOS 1.6 or higher, 24K memory minimum, H19/H89 ..... $29.95
For CP/M 2.x or higher, 24K memory minimum, H19/H89 ..... $29.95
For CP/M-85 ..... $29.95
For ZDOS $29.95

SNAP — A Screen Note and Print Program

SNAP will print or create a file of whatever is displayed on the screen of the H19/H89 terminal or copy the contents of the screen directly to the printer. It will even take care of translating the escape sequences for the H19 for graphics mode enter/exit to those used by the H25 printer. Since SNAP is entirely indifferent to how the screen received its current contents, it can be used for a wide variety of practical purposes.

- It can preserve the user's off-line entries, including the construction of designs with the graphics characters, utilizing the terminal's editing commands.
- It can preserve a screen full of messages from a program: a list of compiler diagnostics with line numbers, a memory map, a data base retrieval, or the results of some numerical computation.
- It can preserve the user's notes on a computing result, written off-line, possibly in a blank area of a screen of messages from a program. SNAP can generally improve both the speed and the accuracy of computer work in those circumstances in which the user will normally reach for a pencil and pad.
- Finally, SNAP can be used as a convenient means of building the screens to be displayed by a program. Instead of laboriously calculating the parameters that would make a screen look right, the programmer can simply construct the screen, off-line, as he wants it to appear. Preserved as a file, it can be input when required by the program or, in some languages, held as the contents of a buffer within the code of the program itself.

Both SNAP and its auxiliary utility program SNAPTYPE are entirely menu driven; instructions are given on the screen for every required response. A manual is provided to give more detailed information on many points.

For CP/M 2.x, H8/H19, H89 ..... $29.95

CHKPRO — Checkbook and Credit Card Manager

CHKPRO is a program designed especially for the H19 terminal for managing your checkbook, savings and charge card accounts. CHKPRO takes full advantage of the screen of your H19/89 to make input of data a breeze! Account balances are automatically calculated as new data is entered. This program uses a highly interactive display without the need for excessive keystrokes or menus, similar to a screen oriented text editor. Entries can be categorized for producing complete printouts of any specific category of a report on all categories.

For CP/M 2.x or higher, 32k memory, H8/H19 or H89 ..... $29.95
For ZDOS $29.95

Attention Program Authors

NEWLINE SOFTWARE is searching for original, high quality programs for the H8, H89, and Z100 computers. We are interested in GAMES, GRAPHICS, BUSINESS SOFTWARE, UTILITIES, LANGUAGES, COLOR GRAPHICS or any other software for the businessman or hobby computerist. Programs must be written for ease of use, take advantage of the hardware features, and be fully documented (source code not required). You can earn high royalites for your programs without interferring with your hobby. We will evaluate your programs in strictest confidence. Materials will be returned only if return postage is provided.

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"Spooler" is an acronym for Simultaneous Perpheral Output On Line. In other words, a spooler allows you to output files to perpheral device (printer, etc.) while still using the computer to run other programs. UNIVERSAL SPOOLER provides multi-tasking computing by allowing you to print files in the "background" and use your computer at the same time to edit, run BASIC programs, or any other programs, in the "foreground". Most spoolers require you to purchase a device driver for a specific printer model or provide one or more device drivers with the spooler for a limited class of printers. UNIVERSAL SPOOLER uses whatever printer device driver you currently have on your system. This means that any device driver that takes advantage of the specific hardware features of your printer will work with UNIVERSAL SPOOLER! (Note: Your device driver must conform to the HDOS standards for device drivers.) There is no need to purchase another printer device driver to use UNIVERSAL SPOOLER on your system. Complete source code included.

For HDOS 2.0 or higher ..... any serial printer $29.95

Computer Assisted/Instruction in MBASIC

This Computer-Assisted-Instruction course in the MBASIC language was written exclusively for the novice Heath/Zenith computer user. It covers the essential fundamentals of the language and will provide a sound base for learning to program in MBASIC. The program will lead you through each command, covering sample programs which will increase your understanding. You will also construct programs yourself, using the knowledge you have gained. After completing the course, you should be able to begin programming your own applications in MBASIC. Contains 24 lessons.

For CP/M 2.x, H8/H19, H89, 48k memory, MBASIC $59.95
For HDOS, H8/H19, H89, 48k memory, MBASIC $59.95

MX-80* Device Driver (MX.DVD)

The MX.DVD device driver was designed to make use of many features of the MX-80 and the MX-80 F/T printers. Up to 8 separate units or logical printers are supported by MX.DVD. Each logical printer can be configured to use a different set of MX-80 features, making a single physical printer default to using different features on each logical unit. Each unit of the MX.DVD has a separate table of options that can be set using the HDOS SET program. MX.DVD Device Driver Features:

- Echos current settings of SET options (SET MX: HELP)
- 15 available SET options
- 8 logical printer units, each independently SET
- Automaticlaly converts graphic characters (requires GRAFTRAX* option)
- Allows single sheet printing
- Permanently enables double width or double width / compressed printing — when selected
- Allows changing of the unit settings from software
- Allows aborting or pausing during a printing job
- Selectable printer or software processing of TAB characters
- Automatic page numbering available
- Setting of form length internally and at the printer
- Selectable 8250 ACE modem status register bit interpretation for printer busy signal
- Selectable line height from 1 to 85 dots
- Selectable character size — 40, 66, 80 or 132 characters / line
- Emphasized and double strike printing selectable

For HDOS 2.0 or higher, MX-80 or MX-80F/T $29.95

MD: — Modem Communications Device Driver

This device driver allows a H8 with a H-8-4 serial interface or a H89 with a H-88-3 serial interface to be used as a terminal for communication with a remote computer system. The switching between HDOS and REMOTE mode is accomplished at any time by the user simply typing a special character on the keyboard. Included is the ability to copy ASCII or Binary files to or from the remote computer system by using the standard HDOS COPY command. Text files received from a remote system can also be directed to the local printer. This driver also can be used as the basis for a bulletin board system. MD supports XMODEM protocol for binary file transfers. 25 setable options.

For HDOS 1.6 or higher, H-8-4 or H-88-3 serial interface and modem communications device . . $34.95

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Premium quality diskettes manufactured by Nashua Corporation, a worldwide supplier of disk packs, disk cartridges and flexible diskettes at a reasonable price. (Includes shipping in U.S.A.)

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POLYBYTES

LUCIDATA PASCAL

Polybytes' versatile implementation of Lucidata's field proven Pascal system provides the HDOS or CP/M programmer with a powerful language system which is fully compatible with his/her current operating system. Pascal's data structures and programming constructs combined with Lucidata's 9 digit REALs, and extensions such as program chaining and random disk file access, give this system the sophistication to handle the most complex programming tasks.
Lucidata Pascal Version 3.8 ..... **$55.**

P-CODE TRANSLATOR

For application programs that require more speed than is available with the standard pseudo code (P-CODE) implementation of Lucidata Pascal, **Polybytes** offers **TRANSLAT. TRANSLAT** will convert the P-CODE emitted by the Lucidata Pascal compiler into a form suitable for assembly and linking using Microsoft's M80/L80 assembler package. Execution speed increases of up to 3 to 1 may be achieved with **TRANSLAT.**
TRANSLAT ..... **$25.**

GRAPHICS/SOUND/MATH SUPPORT PACKAGE

High level language support is a must for efficiently programming the hardware on the HA-8-3 and HA-89-3 circuit boards from New Orleans General Data Services, Inc. **Polybytes'** support package provides high speed procedures and functions which allow sophisticated applications to be developed in Pascal. Custom versions of this package are available for other similar products for H8 and H89 computers.
HA-8-3/HA-89-3 Support Package ..... **$25.**

POLYBYTES' products are available for HDOS version 1.6 and higher, and CP/M version 2.0 and higher, and can be shipped on hard or soft sectored 5¼", or 8" single density (CP/M only) disks. Send check or money order to:

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That's 16 times more than an 8–bit processor: 1024K, or 1 megabyte.

However, Eubanks hastened to point out that 8–bit computers have some advantages. First, there's a lot of software available. Second, the price of an 8–bit computer is generally less than the price of a 16–bit machine. Eubanks predicted that three trends will continue in the 8–bit market: more and more very low cost computers; more memory (although not as much as in 16–bit systems, some of which now come with as much as 256K RAM); and greater user friendliness. (I suspect that perhaps the first and the last of these trends are related; users may tend to consider less expensive computers more friendly...)

Eubanks said trends in the 16–bit market are harder to predict: it's a growing market. There are several different microprocessor chips among which hardware and software developers may choose: Intel's 8086/8088 (the processor used in the IBM Personal Computer (PC) and the Z100); Zilog's Z8000; National's 16000; and the trendy Motorola 68000.

Eubanks touched lightly on several other industry developments. Hard disks, he predicted, will become more affordable. Soon floppy disks will be able to store up to 5 megabytes each. The size of floppies will continue to decrease; microfloppies in the 3" to 3½" to 4" range will be more and more common. "Standardization would have an incredibly good impact on the industry as a whole," Eubanks said wistfully. He thinks we'll soon be "looking at color ink jet printers for $800." He also believes we'll see more "standardizing of application user interfaces." Software producers will integrate their applications packages, so that, for example, "help" operations will be the same from program to program. The user will only have to learn one way of interfacing with the computer. "This is what the industry is moving towards," Eubanks said.

More speakers

Digital Research brought out a series of speakers to keep the trade press happy until Gary Kildall's speech at lunch time. The first of these speeches was given by Ralph Gilman of InfoCorp, who reviewed trends and forecasts for the microcomputer market. (He rather disarmingly announced at the beginning of his talk that "This is a subset of a speech I made in December.") Jackie Pakarinen of the Operating Systems SBC gave a straightforward talk on "Making Computers More Accessible Using Operating Systems." Alan Beebe of the Languages SBC spoke on "Programming Tools and Languages." And Fred Langhorst gave an imposingly technical explanation of DRI's apparently vigorous efforts to create some microcomputer graphics standards.

At a coffee break, I chatted with Omri Serlin of *SuperMicro* newsletter, which concentrates on the upper end of the microcomputer industry (16–bit and 32–bit systems). When he learned that I write for a Heath/Zenith magazine, he warned me: "Anyone who's not talking to Apple or VisiCorp about integrated operating environments will be in big trouble, very soon"—perhaps within three to five years, I gathered.

He was referring to Apple's new Lisa computer system and VisiCorp's VisiON software. I'll take Lisa as an example, since I happen to know more about it than about VisiON, but I understand the two systems share

most of the following features. Lisa has a standardized applications interface; you only have to learn *one* way to tell each of Lisa's applications programs what to do. Lisa also features integrated applications operations; this means you can, for example, take a picture from LisaDraw, the graphics package, and "cut and paste" it directly into LisaWrite, the word processor program. Furthermore, Lisa's applications run concurrently, which means that you could do that cutting and pasting without having to exit the graphics or word processing programs. Finally, Lisa also uses a "mouse" to control the cursor. The mouse enables you to move the cursor rapidly about the screen by moving a little device around on the desk next to your computer. The cumulative effect of these developments is to vastly enhance Lisa's ease of operation.

Barry Watzman, computer product line manager for Heath/Zenith, told *Sextant* that he's aware of these integrated operating environment software products. "We expect to be at the forefront when products really become available," Watzman said. "We're looking at several products," he said, including VisiON, and also Lotus Development Corporation's 1–2–3, an integrated spreadsheet/word processing/graphics package.

After a long morning of speeches, the press contingent swooped down on the (free) lunch. Lunch-time conversation centered on topics such as the *real* story behind the sale of a big, glossy, year-old microcomputer magazine—and the subsequent defection of almost its entire editorial staff; which hotels one should stay at when covering artificial intelligence conferences in Tokyo; and the creation and propagation of rumors in the computer industry. (A representative of a large data processing weekly confessed to having started a rumor that Texaco is about to buy Apple Computer Company.)

Kildall & kids like Logo

The theme of Digital Research's day was "Making Computers More Accessible to People," and Gary Kildall's capstone presentation was most appropriate: he introduced DRI's DR Logo interpreter for the IBM Personal Computer. Kildall said, "As personal computers pervade our society, Logo promises to become this decade's most widely accepted computer programming language." DR Logo is, to quote the literature which Kildall distributed, "a simple yet powerful interactive language, suitable for all levels of programming ability." DR Logo "is easy to learn," but "supports interactive graphics and list processing."

"Older people are used to choosing by menu, because they go to Chinese restaurants. ... Perhaps, in the future, choices will go across the top of the screen, and you'll shoot them down."

Many people know of Logo as a popular educational programming language. Logo uses a graphic device—the "turtle"—to introduce children to the computer. They can very quickly learn how to make the "turtle"

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draw simple figures and perform repetitive procedures. Logo is also a good language to teach programming techniques; Kildall noted, "in a sense the computer really programs the child; the child takes a rather passive role." Logo's graphics capabilities are essential to its success. Kildall said, "The starting point for kids nowadays is they have to have graphics. They've been out there putting quarters in the machines."

Kildall gave his son DR Logo in the hope of interesting him in learning how to program. "The first thing he did with his DR Logo was build a library of Donkey Kong procedures." Kildall senior was a bit crestfallen at this development. Kildall junior and his friends did eventually venture into more challenging projects. However, Kildall reported wryly, they used "a different computer language." The moral of this story seems to be that acquisition of computer skills is peer-driven, not parent-driven.

Kildall pointed out that DR's implementation of Logo for the IBM PC has some special advantages. The workspace for Logo is 40 times larger than for previous implementations, thanks to the size of the IBM's memory. This is a good omen for Z100 owners, since the Z100 is potentially compatible with IBM PC software. Whenever "Z-Logo" is implemented, it will be *powerful.*

The CP/M '83 exhibition floor

The conference opened Friday morning at 11:00 a.m., as a crush of eager software fans poured onto the exhibition floor of the Moscone Center. Indeed, the crush was sufficiently thick that a dangerous situation developed just before the doors opened. The escalators were pouring people down into a rather compact lobby area which became so crowded that it was difficult to get *off* the moving escalator. However, the doors were soon opened, and the congestion moderated to merely unbearable.

Buss reader Joseph F. Stroface of Lancaster, California, had a blunt report on some similar problems. "Couple the expected bad weather this time of year (which was on-target) and the poor location of the convention center (which has grossly inadequate parking) with the vastly underestimated number of attendees ... and you can guess how many disgruntled, damp, and downright surly conventioneers there were...." The weather was indeed dreary, the parking limited, and the crowding fierce—problems, I must admit, worth some consideration the next time around.

Even after the doors opened, the traffic pace on the exhibition floor was the pedestrian equivalent of rush hour. It's slow and frustrating, but you do eventually get there, usually in one piece. It took me about two and a half hours to make a complete circuit of the 14 major aisles along which vendors displayed their wares. That's about ten minutes for each hundred-yard aisle, which was a long time if you were just trying to get from Point A to Point B. On the other hand, if you were willing to stop and sightsee, there were literally tens of millions of dollars worth of computer hardware and software, often available for "hands-on" tryouts.

Almost every one of the two-hundred-plus vendors at the conference had something worth inspecting for five or ten minutes. That's a thousand or two thousand minutes—sixteen or thirty-two hours. The exhibition

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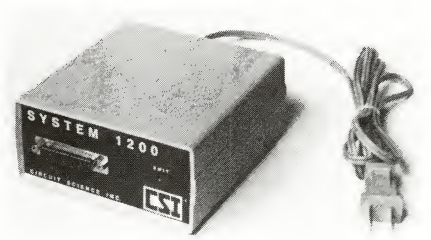

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What it does

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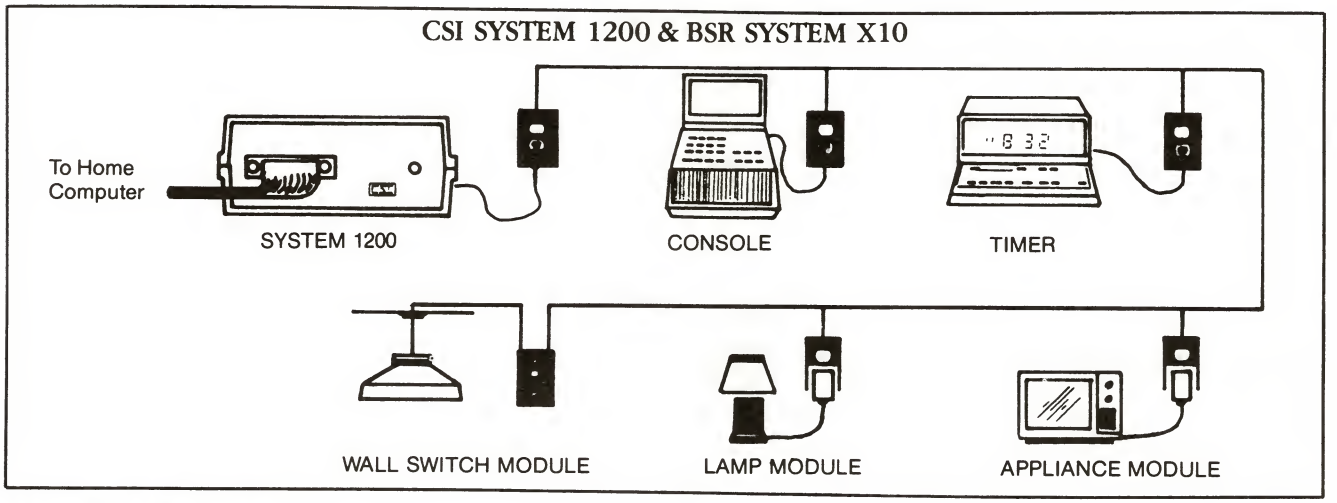
The X10 System

The BSR X10 System (also sold under the trade names of SEARS Home Control System, RADIO SHACK (Plug 'n Power) and in Europe by Busch-Jaeger Electro) incorporates arm chair control with just a push of a few buttons.



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A AL ALL —ALL ON . . . Turn all LAMP modules on
ON —ON . . . Turn on selected module
OF OFF —OFF . . . Turn off selected module
D DI DIM —DIM . . . Dim selected LAMP or WALL SWITCH module
B BR BRI —BRIGHT . . . Bright selected LAMP or SWITCH module
<CR> —CARRIAGE RETURN . . . This code will cause the command to be transmitted to the module

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hall was only open for twenty-one hours all told (from 11:00 a.m. to 6:00 p.m. Friday, Saturday, and Sunday) so you can see that sightseers had their work cut out for them.

Some large computer companies had impressive displays. Digital Equipment Corporation showed off its new Rainbow professional computers. The graphics were impressive, with 800 x 240 pixel resolution, although the monitor was enclosed in an oddly shaped box which I personally found somewhat off-putting. Not many other people seemed to care, though—the DEC booth, which had a very central location, was continually filled with spectators in three-piece suits. *Buss* reader Rod Adams of Norwalk, Connecticut, told me: "I came away feeling that there were two companies coming on strong: Digital Research and Digital Equipment."

Digital Research, of course, had a large, impressive booth right at the entrance to the exhibition hall. The booth personnel were hovering about, distributing literature and answering questions. DRI had various members of the CP/M product family "up and running" on many different types of computers and terminals—including a Z19.

DRI made some interesting new product announcements at CP/M '83. Perhaps the most exciting was Concurrent CP/M–86. The availability of a concurrent 16–bit microcomputer operating system at a reasonable price ($300) represents a "breakpoint" in software technology. Concurrency means that you can run more than one application program simultaneously. For example, you could type a memo on a word processor while referring back to your spreadsheet program to find the appropriate figures. Such capabilities will significantly enhance individual productivity.

Incidentally, there was one development related to DEC computers which I found rather interesting: there's a new DEC users' magazine, *I/O*, based in Boston, which will start publishing in June. Brand-specific computer magazines—like *PC*, *Softalk*, *InCider*, (and, yes, *Sextant*)—seem to be growing rapidly, and perhaps at the expense of some of the general-interest microcomputing magazines. I talked with Steven Nelson, publisher of *I/O*, and we agreed that brand loyalty among computer users is much stronger than many publishers apparently recognize. Heath/Zenith users, at least, have certainly shown intense loyalty to the Heath/Zenith product line.

Continuing on my methodical counterclockwise tour of the display area, I visited Perfect Software, which had two booths. One was a cable car (!), and the personnel staffing that booth had just two functions: handing out free Perfect Software T–shirts, and directing the recipients to the *main* Perfect Software booth on the other side of the hall. At *that* booth, there were daily drawings to win a KayPro II portable computer. Perfect Software also displayed their integrated line of applications programs: Perfect Filer, Perfect Calc, Perfect Writer, Perfect Speller. It was, in the best sense of the phrase, Perfect P.R.

Ashton-Tate had a medium-sized booth on the periphery of the traffic pattern, but it was still jammed with people who wanted to learn about dBASE II, their best selling data base manager system. The booth had literature about dGRAPH—"a graphics system for dBASE II"—and Financial Planner, a spreadsheet-writing language intended for high-powered financial modeling. Perhaps most importantly of all, they were giving away some nifty dBASE II key tags.

Two more big names, VisiCorp and Osborne Computer, had high-visibility displays. VisiCorp had a continual flow of visitors, drawn both by the fame of VisiCalc and by a desire to hear more about the new VisiON integrated operating environment. (Although it was ironic to see VisiCorp at a CP/M conference, since when VisiCalc first became available it ran only on the Apple II and its proprietary operating system, Apple DOS—and *not* on CP/M.) Osborne Computer had ten or fifteen Osborne I portable computers set up and showing their paces, and appeared to be doing very good business. (Although I personally was more impressed by the KayPro IIs I saw set up in several software vendors' booths.)

Some big names were notable by their absence. IBM was never even mentioned on the exhibition floor. Well, hardly ever. Digital Research spokesmen *did* explain their plans to sell CP/M–86 (the 16–bit version) for the IBM PC at $60, or one-fourth of the price IBM charges. DRI is trying to cut into the market for the IBM Personal Computer's Disk Operating System, PC–DOS, which is, like Zenith's Z–DOS, based on Microsoft's MS–DOS.

In a related development, Barry Watzman of Heath/Zenith recently told *Sextant* that *standard* CP/M–86 will be available for the Z100 "probably in 1983." This is a little sooner than planned, Watzman said. CP/M–86 wasn't originally a very high priority

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item, until Zenith software developers saw that it had been announced in a Zenith Data Systems software catalog—by mistake.

The Heath/Zenith community at CP/M '83

Zenith didn't make it to the show. According to computer product line manager Watzman, the reason was that CP/M '83 was announced *after* Zenith Data Systems had already made up its conference budget for the year. It's unfortunate that Zenith didn't come; this would have been a marvelous opportunity to make CP/M users aware of the H/Z89 and Z100 machines. Watzman said afterwards, "We did not attend; in retrospect, we should have."

However, a few Z–machines showed up in the exhibition hall. A.D.S. Software of Roanoke, Virginia, was demonstrating an 8–bit CP/M payroll program on a Z100. Pragmatic Designs, a systems integrator from Sunnyvale, California, was showing a CompuPro system which used a Z19 terminal. TCS Software of Houston, Texas, was demonstrating its business accounting software for the Z100. And, as mentioned above, Digital Research was using a Z19 for one of its CP/M demos.

Magnolia Microsystems, an independent supplier to the Heath/Zenith community, had more Heath/Zenith hardware and software than anyone else. Magnolia demonstrated a 4 MHz Z80 co-processor for the Z89, which roughly doubles the computer's processing speed. The old 2 MHz processor functions as an input/output (I/O) processor for the new 4 MHz central processor unit (CPU). Meanwhile, the 4 MHz processor runs a small virtual operating system which passes all system calls to the Z89, allowing the application program to use up to 63K of RAM. Magnolia points out one handicap: because of power supply restrictions inside the Z89, you can't use an internal disk drive with the co-processor.

Magnolia also had some interesting software demonstrations. They had three Z89s set up to show off a forthcoming product, MMS-Net. MMS-Net is a local area network which uses a "token-passing" technique with RS-422 data transmission. Users of MMS-Net will have a Z89 with 4 MHz co-processor at each user station (or "network node"). Magnolia also announced that they have signed an OEM license agreement with Digital Research which will allow Magnolia to distribute CP/M Plus. CP/M Plus has considerably enhanced capabilities; however, to get the full benefit of the enhancements, you must have more than 64K RAM. CP/M Plus is still compatible with CP/M 2.2 software.

(For more on Magnolia Microsystems, see Hal Glatzer's "Putting the 'O' in OEM," in the Fall 1982 issue of *Sextant*.)

The future of microcomputing software

Friday afternoon, six microcomputing celebrities spoke at a two-hour seminar on "The Future of Microcomputing Software." Gordon Eubanks was the author of the CBASIC language, and is now a vice president at DRI. Alan Kay was formerly at Xerox's Palo Alto Research Center (PARC), where he led some of the most important research efforts in computer science in the early Seventies. He's now chief designer for Atari. Dan Bricklin was one of the co-authors of VisiCalc, the first spreadsheet program, which he wrote while still a student at Harvard Business School, and which was sold by Dan Fylstra of Personal Software. Now Bricklin and co-author Robert Frankston have founded their own company, Software Arts, and Fylstra is chairman of VisiCorp. Ida Cole is director of software for the Apple II and III. All in all, quite an assemblage of expertise on "The Future of Microcomputing Software."

It's no wonder, then, that the auditorium was filled to standing-room-only for the 2:00 p.m. seminar. When moderator Gordon Eubanks took the microphone, he looked around at the immense audience and said, "I understand the promoters promised Willie Nelson," the country and western music star. "This explains the fantastic turnout." The congestion around the entrance was so thick, in fact, that Alan Kay, the first speaker, got trapped outside. Eubanks had to intercede via the P.A. system in order to get Kay to the podium.

"I'm here as an old fogey," Kay began. (He looks like the prototypical graduate student: youthful face, bushy black hair, intense eyes.) "I got paid for my first piece of code in 1961, when there were two hundred and thirty computers in the United States. To put it mildly, there have been some changes."

Kay saw the planting of the seeds for the microcomputing industry in the Sixties, and he's seeing it flourish in the Eighties. Most people regard that 20-year history as a record of extraordinary success. Consequently the tone of Kay's remarks was rather surprising.

"Computer research has gone through a number of phases; we're entering a very dangerous one now," he warned. "Why haven't the standards of quality developed as strongly as they did in the Sixties?" In that decade, Kay noted, the Defense Department's Advanced Research Projects Agency (ARPA) funded many of the computer science projects which laid the groundwork for the microcomputer revolution. Kay seemed to fear that the microcomputing industry today is not making any significant contributions to computer science. The cutting edge of current microcomputer technology—applications programs running concurrently using "windows" onto virtual screens; "mouse" cursor control; integrated operating environments, etc.—is relying on ideas which are familiar to computer

scientists. "Why the heck are we going back into the Seventies for 'window' interfaces? Why are we going back into the early Sixties for our operating system ideas?"

What *does* Atari's chief designer like about current microcomputer technology? "VisiCalc is the first and only significant piece of microcomputer software," he said at one point. Of course, the first spreadsheet program is an extremely valuable piece of applications software. But Kay had something more in mind: "VisiCalc is an excellent way of organizing an operating system," he noted. "If you think of VisiCalc as a kit, then you have to ask the question, are programming languages relevant anymore?" VisiCalc, and many other sophisticated applications programs (for example, dBASE II), provide the user with what are in effect "mini-languages." VisiCalc is more than *one* application; it is a kit which enables the user to create *many* applications tailored to suit individual needs. So, Kay suggested, "Maybe we need a 'kit kit.' "

He wrapped up his twenty minutes with a strong pitch for innovative microcomputer science. "My plea is, let's not try to improve what we've got; let's try to do something much better than what we've got."

The view from Apple

Ida Cole, director of software for the Apple II and III, began her remarks by posing a question: "What is it going to take to succeed ten years from now in the microcomputing industry?" Then she explained "the basic methodology" of her speech: "look back ten years ago, and analogize to ten years ahead. What did it take to succeed in 1973?"

Of course, the most obvious change in the microcomputing world between 1973 and 1983 has been the exponential growth in the computing power available to a single person. Ten years ago, who could have imagined it: today you can sit in front of a Z100 with 128K RAM built in (and expandable to 768K). One might reasonably surmise that success in the microcomputing industry went to the companies which developed these new, powerful technologies. Unfortunately, perhaps, it didn't always happen that way—success often went to the companies which were most successful at *bringing those new technologies to the consumer.*

Ten years from now, Ida Cole expects "more, better, faster, easier to use" software. But commercial success may not depend on technological prowess. Ida Cole believes the technology will "move ahead on its own." To create successful software in the future will call for more than just programming skill. "The things that will differentiate [software companies] are 1) mastering distribution channels: getting attention, physically delivering the software, providing support; 2) hiring management with high growth experience, as well as marketing and financial skills; and 3) creating integrated software families."

Adam Osborne

"Adequacy is sufficient; everything else is irrelevant," said Adam Osborne, in ringing, supremely self-confident tones. He founded one of the first successful computer book publishing houses, Osborne & Associates, now Osborne/McGraw-Hill. Then he founded Osborne Computer Company, which manufactured the first commercial portable computer, and more or less

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Osborne's declared philosophy of adequacy is diametrically opposed to Alan Kay's pursuit of excellence. Osborne acknowledged this fact at the outset. "Alan is one of the nicest people I know, but also one of the persons I most often disagree with." Osborne has a flair for public speaking, and he entertained his audience with a vivid argument in favor of commercial practicality in the design of microcomputer hardware and software. "Better is the enemy of good," he pronounced. "IBM taught us that to be number one, you don't have to be the best. You have to be adequate, relevant, and supported."

Next, Osborne turned to an analysis of the future of the software market. "One thing I learned in the publishing industry," he said, was that publishers make their profits exploiting authors. "Authors are poorly paid, and publishers pick and choose among them."

He paused portentously and said, "So it is with software." The software publishing market, in other words, will be changing from a sellers' market, where cottage industry firms proliferate, to a buyers' market where publishers with professional distribution systems predominate. And with software as with hardware, "adequacy is sufficient; everything else is irrelevant." In practice this means that "better" software will not necessarily outsell "adequate" software if the latter has an advantage in "the Darwinian process of natural selection" which Osborne sees operating in the software industry.

Osborne concluded with some vigorous advice on how to survive in the software business: "People are going to look for convenience; they are going to look for compatibility. Companies with unique computers and unique software are deluding themselves if they think they're going to succeed."

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Fylstra, Bricklin on the art of software

"Anyone who gets paid for thinking will expect to find that his personal computer has a concurrent operating system; local area networking capability; integrated applications software; and user-friendly software design," Dan Fylstra, chairman of VisiCorp, told the seminar audience. He was describing features similar to VisiCorp's VisiON and to the Apple Lisa (discussed above). The software industry is changing to meet those needs. "Future development times for software will be two to three years," he said. "And product lines should last in the marketplace for five-plus years."

Of course, a lot can happen in two or three or five years, especially in the microcomputer field. "Hardware targets will change out from under you," Fylstra acknowledged, although he thinks hardware configurations are converging: "16–bit processors, 256K RAM, bit-mapped graphics," according to one slide he showed. Development methodologies will accomodate changing hardware conditions. Future software creators, Fylstra says, will make more use of tools to augment their flexibility in dealing with new hardware—"high-level languages," "standard interfaces," "automated testing tools," and "documentation production tools."

"The basic idea is, the medium is the message," said the next speaker, Dan Bricklin, one of the original designers of VisiCalc, and a cofounder of Software Arts. "Different machines are for different software. Personal computers demand interactive software." Bricklin explained that good software should depend on a machine's strengths, not its weaknesses. Personal computers are good at sending information from screen to CPU: Bricklin termed this a "high bandwidth." On the other hand, personal computers are not so good at sending information from the screen to disk; there, they have a "low bandwidth." Good software design takes advantage of the "high bandwidth" and emphasizes applications which can benefit from powerful interactive screen displays—applications such as VisiCalc.

Bricklin also looked at the overall state of the software industry. "We've reached a critical mass now," he said. "If all the programmers in the world who are working on creative programs were to die, we'd still have enough software to justify the existence of personal computers." He hastened to note, however, that "we will still be adding *adequate* software." He added, "Adam's right—all that's necessary is to be adequate."

(It is possible, I think, for a product to be both innovative *and* merely adequate. Indeed, the Osborne I is an example of such a product. Adam Osborne's portable computer was an original, innovative product *idea*, but the *implementation* of the idea was merely adequate—and extraordinarily profitable.)

Bricklin appeared confident that there will be innovative new software products. "There'll be new metaphors coming out," he said. The CP/M '83 crowd heard a lot about "metaphors" from software designers. The user is presented with familiar objects or methodologies at the interface with the applications program.

These "metaphors" provide the user with a comfortable way to understand the complex manipulations of information which are going on behind the screen. A paper spreadsheet is familiar to most accountants, bookkeepers, and business school graduates; that's one of the secrets to VisiCalc's success. Apple's Lisa software is based on another, even more familiar, metaphor: the desk. The "mouse" moves the cursor to "icons"—little drawings on the screen—which symbolically represent the operation the computer is to perform. For example, if you wanted to delete a file, you'd move the cursor to an icon of a wastebasket. Coming up with easily understood new metaphors, Bricklin implied, will be one of the secrets to success in the software market of the Eighties.

VisiCalc and Lisa use metaphors which are familiar to most business people of this generation, because those are the people who are going to buy software. For a similar reason, Bricklin observed, many applications programs present the operator with a "menu" of choices. "Older people are used to choosing by menu, because they go to Chinese restaurants." However, as a new generation of software users enters the marketplace, programmers will search for metaphors familiar to younger people, Bricklin predicted. "Perhaps, in the future, choices will go across the top of the screen, and you'll shoot them down."

Seminar questions and answers

The question-and-answer period at the end of the seminar elicited some back-and-forth between Alan Kay and Adam Osborne. "I almost agree with Adam," said the chief designer for Atari, "except I'm afraid that he's making computerdom safe for 'The Dukes of Hazzard.' TV is an example of an industry which persuaded the people that 'Laverne and Shirley' was 'adequate.' " Osborne replied succinctly: "The people persuaded *TV* that 'Laverne and Shirley' were 'adequate.' "

Later on, in a reply to another question, Kay granted that Osborne had a philosophical point, but objected, "I don't think we've gotten to a place where adequacy is well defined. I haven't used a [microcomputer] word processor that I think is adequate. Very few programmers have any idea of how to cut down features and maintain functions."

Clearly this is a debate which will never be entirely resolved. There will always be people like Osborne, who press aggressively for satisfactory performance and maximum profitability, and they seem to be establishing themselves securely in the microcomputer industry. Ida Cole of Apple said, "We're going to see lots and lots of very slick merchandising. Computers are now being merchandised as commodities."

There's nothing wrong with that; it's the result of a normal industrial growth cycle. It is important, however, that the microcomputer industry should continue to listen to Alan Kay and his allies, who want to push past the frontiers of current technology, in search of quality. It would be a dreary industry if one could *only* buy from manufacturers whose credos echoed Osborne's: "Adequacy is sufficient; everything else is irrelevant." There should be *some* manufacturers out there whose corporate philosophy is similar to Zenith's: "the quality goes in before the name goes on." Adequacy is fine for many people, but—for example—what about those who want to expand their systems to suit their personal needs? That's where a more-than-adequate product (such as the Z100, with its S100 bus) will come in handy. *Sextant* readers will agree: it's good to have a choice, not an echo.

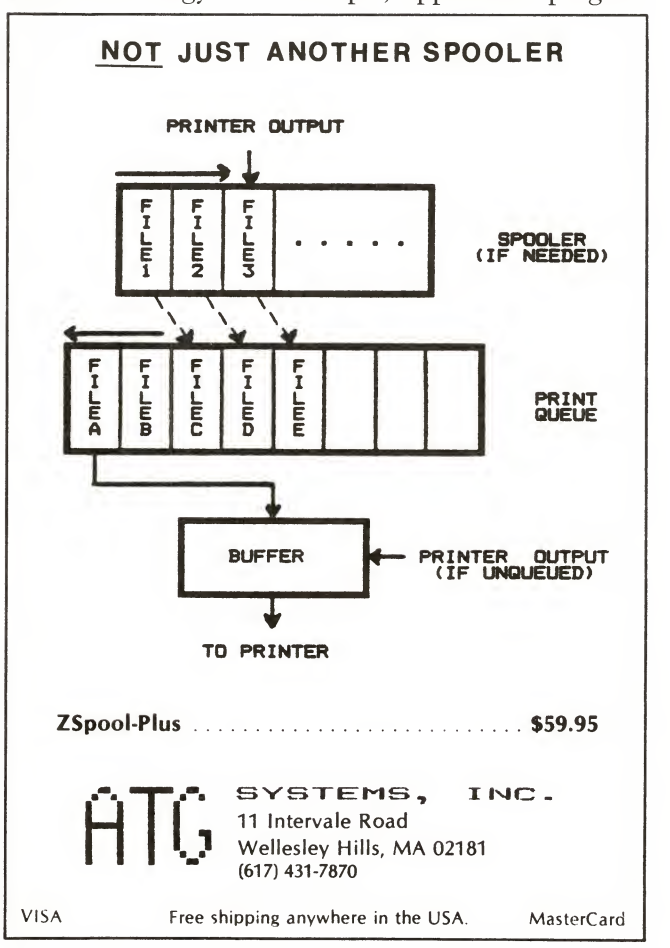
Gordon Eubanks, in his position as moderator, found one statement which everyone in the crowded room could agree on—"I venture to say that the speakers today were more than 'adequate.' "—and the audience roared its approval.

Guerilla theatre in Moscone Center

"I know this is going to be a friendly session," Portia Isaacson said, as she handed out toy tommy guns to the participants in Saturday's seminar on "Trends in Operating Systems." The audience laughed politely. (Although I heard one woman sitting near me say, "I'm disgusted.") Isaacson didn't bring a gun for herself, noting cheerfully, "It's well known that my weapon is my mouth."

The first combatant was Jean Yates, President of Yates Ventures, a publishing company specializing in information on software. Yates Ventures is known for its studies of Unix, the trendy operating system developed at AT&T in the early Seventies. Jean Yates is a big Unix booster; she said, "Unix is a quantum leap in complexity and features from CP/M and MS–DOS. The difference between CP/M and Unix is the difference between driving a car and flying a plane." (Although, as one member of the *Sextant* editorial staff said, "Most of us prefer cars.")

Yates also discussed some trends in operating systems technology. For example, application program



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portability: she advised the audience that "in my opinion, if you see it's written in C, it's a good indication that you'll be able to pick it up and move it around." On another trend, ease of use: "I don't know about you, but I've gotten sort of fond of operating systems that just sit there saying 'A>'." But future operating systems, she believes, "will say, 'Hi! This is your friendly computer with CP/M.' " At this point, Yates leaned over to fellow seminar participant Tom Rolander, vice president for software development at DRI, and whispered (into the microphone): "Tom, are you listening? This is what I want."

The audience laughed at this blatant arm-twisting, and Yates took the opportunity to conclude her talk with a brief, forceful sermon. "Operating systems are evolving like crazy, and it's all to your benefit. But it's up to you to yell and scream and make your needs known."

Rolander, the next speaker, made an interesting point in the course of his discussion of operating system trends. "There are two types of portability, and they do not move in lockstep," he said. He distinguished between "object code portability" and "source code portability." The former type enables application programs to be used on many different manufacturers' machines with similar CPUs; CP/M is an object-code-portable operating system. The other type of portability enables applications to be moved among different CPUs; Unix is source-code-portable. So is the UCSD p–System. The trend is towards source code portability, which makes the choice of a microprocessor less significant in designing or choosing a computer system.

Dale Gifford of G & G Engineering took a turn at the podium. G & G Engineering is a systems integrator, using mostly Godbout Electronics' CompuPros, the first dual-processor computers. "What's the big attraction of dual processors?" he asked (rhetorically, of course). "They allow you to bridge the gap between 8–bit and 16–bit," he answered. Dual-processor computers, such as Zenith's Z100, can run both 8–bit and 16–bit software, sometimes with a substantial improvement in speed over older 8–bit hardware. There's an "abundance" of 8–bit CP/M software out there, which is what "led G & G to invest time and resources in CP/M" as an 8–bit operating system.

"The [dual processor] hardware is here," Gifford said, "what about the system software?" Dual processor operating systems must enable the 8–bit processor to run CP/M, he said. And "both processors must be able to read and write, but not necessarily execute, disk files." CompuPro's MP/M–816 is an example of a trend in dual processor operating systems. It enables two unlike CPUs to operate together. One of the key ingredients in MP/M–816, Gifford said, is the SWITCH program, which "creates an environment in the 16–bit system where you can run 8–bit software invoked by the 16–bit command interpreter whenever the user tries to implement any 8–bit program." Gifford summarized his firm's progress to his audience of 1,000 dedicated CP/M fans: "We think we're on the right track." He paused and said, tongue in cheek, "And if we're not, there's always Unix."

Mark Overgaard of SofTech Microsystems spoke next. He went into great detail regarding his claim that the UCSD p–System meets the requirements for a universal operating system. The p–System uses what is called "pseudo-code" as an intermediary between the

microprocessor and the applications program. All p–System applications programs are translated from a high level language (usually Pascal) into the standard "pseudo-code", which is written for an "imaginary" microprocessor. For each actual microprocessor, you would have an interpreter to translate from pseudo-code into real microprocessor instructions. This method of two-step translation costs the program some efficiency, but it does allow the theoretical possibility of universal portability.

Portia Isaacson

Portia Isaacson heads up Future Strategies, a consulting firm, and is one of the most widely respected analysts of the microcomputer industry. As head of the National Computer Conference back in 1977, she set up the first personal computer festival ever, in an independent area of the NCC exhibition area, and the personal computers stole the show. She believes that computers which use the same (or similar) microprocessors as the IBM PC—"an IBM architecture"—will have an increasingly significant chunk of the market over the next five years.

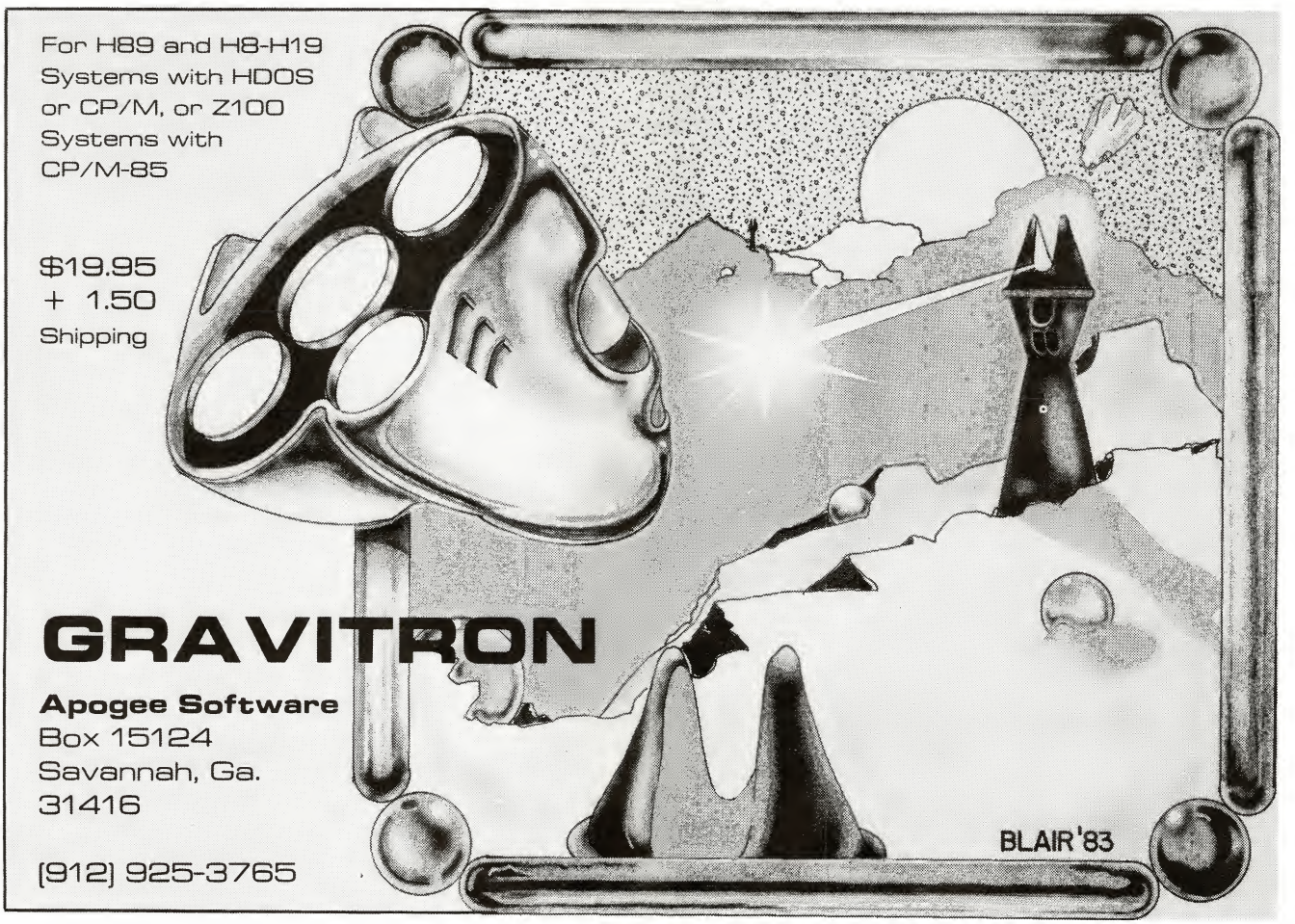
How significant? Rather like the proverbial glass 50% filled with water, it depends on how you look at it: half-full or half-empty. In the half-full view, Isaacson believes that IBM PCs, and PC-compatible designs, will have 44% of the market for $3,000 computers in 1983, and 62% in 1988. Note that those figures include the Z100, which is potentially compatible with most PC software. And those figures will include any other companies which choose, like Zenith and IBM, to base their systems on MS–DOS.

(For a survey of Z100 software, including information on the Z100's compatibility with IBM PC software, see the upcoming Fall 1983 issue of *Sextant*.)

In the half-empty view, those projected market share figures leave from 56% to 38% of the market for designs other than IBM, Zenith, *et al.* This would mean that there will probably continue to be a second group of several different hardware designs supported by proprietary operating systems and independently developed software—Apple, Tandy, Commodore, perhaps. That's a tough group of competitors. They'll leave rather slim pickings for the third group: computer manufacturers who want to survive in the $3,000 computer market by relying on brand-independent operating systems, namely CP/M and possibly the UCSD p–System

"The difference between CP/M and Unix is the difference between driving a car and flying a plane."

So, as you can see, Isaacson didn't project an easy future for CP/M. As indicated in the previous paragraph, there probably will be room for *some* manufacturers of CP/M-compatible hardware—I would infer in the vicinity of 10% or 15%. But going beyond that will be difficult. IBM is emphasizing PC–DOS, its version of MS–DOS, as the primary operating system for the PC. In fall 1982, Isaacson's company surveyed 40 computer



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stores which sell PCs. They sold 597 PCs total in one month, of which more than 96% were sold with PC–DOS, less than 1% with UCSD p–System, and slightly more than 3% with CP/M–86 or Concurrent CP/M. "Can this change in the future?" Isaacson asked. "Well, yes. But," she said, "IBM is the only swing factor." Isaacson seemed to be arguing that despite Digital Research's aggressive pricing policy on CP/M–86 for the IBM PC ($60), DRI is unlikely to make large inroads into the PC market as long as the computer stores emphasize PC–DOS to first purchasers.

She asked, "What will be the standard 'boxes' five years from now?" In the home computer market (under $1,000), she said, the dominant hardware architecture will be either the Texas Instruments 99/4, or a new IBM design. In the "monolithic" workstation market—$5,000 to $10,000—she predicted that "whatever it is, it has concurrency and visual graphics." Isaacson added that her opinion is that Unix may not be as strong in the personal computer industry as it has been in the minicomputer industry. Finally, in the $3,000 personal computer market, where Zenith has its niche, Isaacson said she expects the dominant hardware design will be either the Apple II or the IBM PC.

(Zenith Data Systems is prepared for the PC to be one of the dominant hardware architectures for the next several years. Unfortunately, it has been more difficult than was anticipated to make IBM PC software work on the Z100. Software written for the PC is "optimized" to take best advantage of the IBM's keyboard and screen display functions; the Z100 keyboard and screen display are different. Those functions are controlled by read-only memory (ROM). Zenith Data Systems expects to release a new ROM this summer which will duplicate more functions of the PC's ROM, enabling Z100 users to use the developing PC-compatible software pool.)

Isaacson concluded with some strong words of advice for software developers. "If your business plan as a software developer is to serve one compatibility family," such as the PC-compatibles, "portability [across families] isn't as important. If a software company gives up one ounce of performance to make the product portable, that is *wrong*."

Wrap-up

CP/M '83 was simply too huge for any one individual to see everything. Because of schedule conflicts I had to miss some interesting events: for example, Gary Kildall's Saturday speech, "Introduction to CP/M," and Apple II designer Steve Wozniak's comments on "Computer Industry Ethics." Nor could I attend any of the more than one hundred "software spotlights," in-depth looks at particular software products, which ran each afternoon in upstairs classrooms in the Moscone Center. So a caveat: this is necessarily a selective report.

On balance, though, I must say I agree with Bill Scholz of San Jose, California, whose reaction to the conference was generally enthusiastic, but slightly restrained by some concern that "support for Zenith stuff was pretty meager." In that connection, he observed, "I'm a firm believer that the '89 would have done a little better if they'd jumped on the CP/M bandwagon sooner. It seems to be a defect in their philosophy." Let's hope Zenith goes to CP/M '84! Despite his reservations, Scholz summed up with some cheerful words which captured the mood of most of the people I observed at CP/M '83: "It was a hell of a lot of fun."

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A short word-counting program illuminates a version of Pascal available under HDOS and CP/M.

Hugh Kenner

Herr Professor Doktor Niklaus O. Wirth, the creator of Pascal, hangs out at the Eidgenossische Technische Hochschule (ETH) in Zürich, to which the best-known graduate, Albert Einstein, had trouble getting admitted. I once gave a 55-minute lecture on James Joyce at the ETH, and was told how to name the place the German way, Eh Tay Haw. What I was not told was how seriously they take their scheduling. *Fifty* minutes was what they had allotted, and promptly at 10 minutes to the hour the audience began to shuffle out, with me in mid-sentence and 5 minutes to go. Then the room refilled, and my last words were delivered to different ears entirely.

Never mind such seeming dysfunctions: Switzerland is the country where everything works. No airport baggage-cart has a loose wheel, no public clock is as much as 10 seconds off. You just have to catch the Swiss rhythm, as I had not caught the rhythm of the ETH.

Catch its rhythm and Pascal works like a Rolex. It makes BASIC look like Silly Putty. One long Pascal program of mine—14 pages of listing—has but eight lines of Main Program, equivalent to "Mainspring drives this wheel which drives that wheel which drives hands." The rest is detail, accounted for by Procedures, which are Pascal's equivalent for the fiddly little wheels in between. You define each Procedure as deliberately as you'd carve a gear from brass, for invoking by name as needed.

Once defined, they can be swapped among programs: interchangeable parts. A well-designed Procedure names its own variables, with which data passed in by the calling program get temporarily identified. Wirth may have been thinking of the new identities the flux of variables called "Studentbody" assumes at the thresholds of ETH classrooms: students of Physics one moment, of Computer Science the next. If they wander into a lecture on James Joyce, they even sit for that. Under ETH-like control structures, Pascal variables are extremely well-behaved.

Alas, all languages, human or artificial, disperse instantly into dialects, and Pascal is no exception. The one I'm using is Lucidata Pascal, version 3.8, available from Polybytes of Cedar Rapids, Iowa, for $145 (available for either CP/M or the Heath Disk Operating System—HDOS). Pascal was defined by Wirth and Kathleen Jensen in what is austerely referred to as The Standard. Lucidata's implementation seems to use every statement in The Standard except WITH, a dispensible amenity. It also has file-handling procedures more comfortable than The Standard's for micro users, and enhancements of which I'll be mentioning some. (Lucidata is particularly resourceful when confronted by less memory than a program seems to need. It then enters a "paging" mode that can manage impossibilities at the cost of some fairly frantic disk activity.)

For $295, Heath/Zenith sells the dialect called UCSD Pascal, which I've not tried though I do know that Heath's version is inextricable from a peculiar operating system allowing use of two drives only, both 5¼". The Heath Users' Group (HUG) offers a much less expensive alternative, Tiny Pascal. Members can secure it from HUG for just $20. (See Arnold Madeira's article, "A Candid Look at Tiny Pascal," in *Sextant* #1, Spring 1982.) Z100 users can get IBM's Microsoft Pascal (#60224010), said to run out-of-the-box on the Zenith machine. That one I've not tried either. I'm told it's the version of choice for systems designers, but so feature-laden that less exacting users are apt to find its memory requirements huge and its compile times very long. And I've no knowledge at all of Pascal/MT+ for HDOS, available at $350 from New Orleans General Data Services. What follows pertains strictly to Lucidata 3.8 (HDOS)—at $145 an excellent language bargain—and to Polybytes, a pseudonym for Larry Reeve, the man with the fastest Flit-gun in the West for bugs.

Catch its rhythm and Pascal works like a Rolex. It makes BASIC look like Silly Putty.

That I know because, as is my destiny, within hours of acquiring his Pascal I was face to face with what may have been its sole bug. At 2:00 p.m. on a Saturday I called Larry. At 4:20 he called back: it was fixed. Monday morning, a new disk was in the mail. You'll not get that order of service from IBM or Microsoft or Zenith, where after debugging assiduously they protect their trouble by freezing the final package and apparently burning the mail. (After 18 months I've yet to get action on a bug in Magic Wand.)

Why Pascal?

To business. Pascal, unlike BASIC, is a compiled language—which means that after writing your program in quasi-English on a text editor like PIE, you run it (slowly!) through a compiler to get something usable by Pascal's "Run-time System," PRUN. The Lucidata Pascal compiler gives you a PROGNAME.BIN file, for running, as I'll soon explain, with help from PRUN. Compilation of the BIN file takes several minutes, and the only way to change even its smallest detail is to compile all over again.

A BASIC program, by contrast, you can use the minute you've typed it in, and revise instantaneously. But the costs of BASIC's convenience include, first,

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sluggish execution speed, since every instruction must be "interpreted" into machine language *every time* it's encountered. Ponder what that implies when a loop repeats 500 times: it has to do its interpreting 500 times over. True, PRUN will have to do something similar. But it will be doing so with code—the BIN file—much closer to the computer's native tongue.

BASIC further imposes a restriction on the size of the program, since the BASIC interpreter must sit in memory along with it. And, finally, there is BASIC's bonelessness.

"Bonelessness" means that BASIC is structured like pasta. In *Sextant* #2, Summer 1982, William K. Clarkson described his cure, S–BASIC ($49.95 from Sunflower Software). I'll not repeat his arguments; I'll merely emphasize that BASIC, though easy to learn, is ultimately bad for the mind the way Camels are bad for the lungs. In its environment, you are apt to fob off any task at all on a servant called GOTO and end up as effete as Reginald Van Gleason, III. By the time you have a really complicated BASIC program running, you may find you can no longer understand it. Clarkson's S–BASIC is a wholesome remedy. For several months it served me well, a comfortable halfway-house en route to Pascal. Clarkson mentions its value as preparation for Pascal, with which it shares the "WHILE" and "UNTIL" loops that virtually do away with GOTO. My S–BASIC programs converted to Pascal with little trouble.

One might stay with S–BASIC indefinitely. There's little of BASIC it requires you to unlearn save bad habits, and it offers you fewer ways to make mistakes than Pascal. Since its lines are identical with its statements, it's not dependent on Pascal's statement separator, the semicolon, and you're exempt from the Pascal-writer's commonest error, omitting a semicolon or misplacing it.

So why did I move from S–BASIC to Pascal? Partly, the attraction of Pascal's clean-cut rigor; partly, the 9-place accuracy (vs. BASIC's 6) of Lucidata's number-crunching capability. And the prospect of a stand-alone ".ABS" program that would run without a resident chaperone, BASIC's Interpreter or Lucidata's Run-time System. As I'll soon explain, you can go past PROGNAME.BIN, which depends on the Run-time System, to PROGNAME.ABS, a stand-alone which doesn't. (The CP/M equivalent would be PROGNAME.COM.) Though BASIC offers a double-precision stand-alone via the HDOS MBASIC Compiler, its memory limitations are dismayingly sharp: about 250 BASIC lines (as I detailed in issue #58 of *Buss: The Independent Newsletter of Heath Co. Computers*, November 15, 1982).

I'll not attempt an introduction to the Pascal language. There are plenty. (The best tutorial I've found by far is Doug Cooper and Michael Clancy's *Oh! Pascal!*, Norton, 1982.) I'll tell you instead what you get from Polybytes, and what to do first.

What do you get?

You get a manual and two disks, and you should begin by copying intact onto a disk called PASCAL MASTER the Polybytes disk that contains the interpreter, the run-time system, and their satellites. (There are two versions of the run-time system, one for the 8080 central processor unit (CPU), the other for the Z80; the manual is quite explicit about how to jettison the one you don't need and rename the other.) Have PASCAL MASTER in SY1:, put into SY0: a bootable disk with your editor (I use

PIE), use the editor to duplicate a short Pascal program out of a book, and try compilation. The command is SY1:PRUN SY1:PASCAL PROGNAME, where PROGNAME is an eight-letter program name with a ".PAS" extension. (Don't ever forget that extension.)

After much disk-clattering a perfect program will have compiled, preserved on SY0: as PROGNAME.BIN. (An imperfect one, e.g. your first attempts at writing Pascal, will have collapsed under a weight of error messages.) PROGNAME.BIN will likely be less than half the length of PROGNAME.PAS. You can now execute it with SY1:PRUN PROGNAME. And if you like its behavior, you can even make it into a stand-alone with SY1:PRUN $G:PROGNAME PROGNAME. "$G:" is pronounced Dollar-Gee and is called a *Pragmat*; Pragmats direct the system to make something non-routine happen. That command will speedily place on SY0: a PROGNAME.ABS file for immediate HDOS execution, perhaps 30% shorter than the compiled MBASIC equivalent. (By the way, the *middle* part of Dollar-Gee is what designates your .ABS file, so to make .ABS end up on SY2: you'd type SY1:PRUN $G:SY2:PROGNAME PROGNAME.)

If *fast* stand-alones are your obsession, another $25 to Polybytes will bring you TRANSLAT, which turns PROGNAME.BIN into something the Microsoft M80/L80 package can assemble into PROGNAME.ABS machine code, executing up to twice as fast as Dollar-Gee's PROGNAME.ABS.

In all this, PRUN is the run-time system, which trots alongside your .BIN program, keeping it out of mischief and feeding it necessities like math routines. Why the .BIN file is as blessedly short as it is can be ascribed to built-in ignorance; when it says "multiply," PRUN has to tell it how. An .ABS file, should you choose to make one, incorporates as much of PRUN as the program needs, so the length of an .ABS version can be hard to predict. Example: the COUNT program later in this article uses seven HDOS sectors in its .PAS or "English-language" version. COUNT.BIN, which needs the help of PRUN, shrinks to two sectors. COUNT.ABS, which runs by itself, has 27 when derived from Dollar-Gee, its running time indistinguishable from that of COUNT.BIN guided by PRUN. TRANSLAT yielded an equally self-sufficient 34 sectors after assembly, up 25% but executing 25% faster. The gain in speed would be much greater if the program had less inherent input/output (I/O) delay. PRUN uses 67 sectors plus overlays for error messages, so as against COUNT.BIN plus PRUN you may find COUNT.ABS a fine trade-off, whether from $G or from TRANSLAT. On the other hand .BIN files are so short a disk can hold a lot of them, with a single PRUN for chaperone.

Big, expensive (and slow-compiling) Pascals like Microsoft's let you build up a library of compiled segments for incorporation into programs. Lucidata lets you build up a library of *un*compiled segments, each with the .PAS extension. To get one of them into a program you'd have the program say, at the right place, (*$I FILENAME*), "$I" being the mnemonic for the pragmat "INCLUDE."

Lucidata ingeniously treats devices as files. To send output to a printer you create a file (we'll call it f) by appending its name in parentheses to the program name that heads every Pascal listing. Example: PROGRAM progname (f); (the semicolon is obligatory in Pascal). Then you place f: file of CHAR; among the declarations; you write the statement ASSIGN (f,'LP:'); where LP: is your printer driver; you open this file with REWRITE (f); and you insert f at the head of each WRITE instruction, as WRITELN (f, -----). (Oh—remember to LOAD LP: before a run. The manual seems to call this merely a timesaver, but I've found it obligatory; my Diablo won't work otherwise.)

As is my destiny, within hours of acquiring his Pascal I was face to face with what may have been its sole bug.

A demonstration: COUNT

Enough of this. I'll now take you through COUNT, a demo program the present form of which is about two-fifths my work and three-fifths Larry Reeve's. Though it contains no Procedures, COUNT shows off several features both of Pascal and of the Lucidata implementation.

COUNT does something I often find useful in my scribbling profession: count words in a text file. (The contract says 2,500 words; how close am I?) You'd guess correctly that what it really counts is the spaces between words; and, yes, it's trained to disregard multiple spaces. Since I format with TEXT, my files are sprinkled with lines that start with a dot at the left margin. These command lines should not be included in a wordcount,

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and COUNT ignores them utterly. It counts hyphenated words as two (i.e., a hyphen is a space, though, again, not additional hyphens).

COUNT is not the fastest word-counter around: Software Toolworks' SPELL does the job in a third the time, and checks spelling also. Still, SPELL gets confused by TEXT's soft hyphens (\–) and would see com\–pre\–hend as three words, a failing to which COUNT is immune. Also SPELL won't teach you a thing about Pascal.

Now turn to the listing, observing first that *human* readability is everywhere enhanced. Indenting to keep the loops clear costs no memory at all. Nor do comments

```
PROGRAM COUNT(TEXTFILE);
CONST
  string_len = 80;
  null = CHR(0);  tab = CHR(9);
TYPE
  string = PACKED ARRAY[1..string_len] of CHAR;
VAR
  filename : STRING;
  textfile : FILE OF CHAR;
  thischar, prevchar : CHAR;
  count: INTEGER;
  first : BOOLEAN;

BEGIN {Program}
    count:=1;
    thischar :=' ';
    WRITE ('Counting words in file: ');
    WHILE (count<=string_len) AND (thischar<>null) DO
     BEGIN {Retrieval of filename from command line}
        thischar:=filename[count];
        IF thischar<>null THEN WRITE (thischar);
        count:=count+1
     END;  {Retrieval of filename}
    WRITELN;

    ASSIGN (textfile,filename);
    RESET (textfile);
    count:=0;
    prevchar:=' ';

    WHILE NOT EOF(textfile) DO
    BEGIN {file loop}
       first:=True;                          {Sets newline}
       WHILE NOT EOLN(textfile) DO
       BEGIN {line loop}
          READ(textfile,thischar);
          IF first THEN
             BEGIN {check for TEXT command}
                IF thischar='.'             {No count if TEXT command}
                THEN REPEAT {nocount}
                        WRITE (thischar);
                        READ (textfile, thischar);
                     UNTIL EOLN(textfile)
                ELSE first:=FALSE           {Starts counting}
             END; {check for TEXT command}
          IF (thischar IN [' ',tab]) AND NOT (prevchar IN [' ', tab])
               THEN count:=count+1;         {Counts 1 word if space}
          IF (thischar='-') AND NOT (prevchar IN ['-',''])
               THEN count:=count+1;         {Counts 1 word if single hyphen
                                             and no preceding backslash}
          prevchar:=thischar;               {Updates PREVCHAR}
          WRITE(thischar)                   {Writes char. on line}
       END; {line loop}
    WRITELN;                                {Terminates written line}
    READLN(textfile)                        {Commences another line}
    END; {file loop}
    WRITELN; WRITELN(count,' Words')        {Writes total number of words}
END. {Program}
```

Listing 1: COUNT.PAS is a word-counting program used to illustrate Pascal in action.

(between curly brackets), so scatter them freely. (By contrast, BASIC's REM statements use up memory.) Also, upper case can be freely mixed with lower. I keep caps for Pascal's control statements and reserved words, the list of which is short.

The program name is count(textfile) because it's going to operate on a disk-file, named in parentheses as when a while ago we named (f) for a printer. Remember, all devices are files. Textfile is a stand-in for the real disk-file's name, which will get supplied at run-time. For the duration of this discussion it's going to be DUCK. We name it, once for all, when we call the stand-alone program with COUNT DUCK. Here we employ a handy interaction between Lucidata and HDOS, whereby the "name" part of the Command Line goes to a place an array can fetch it from. The array was declared as filename, and a loop starts pushing characters from DUCK into filename until a null is encountered. The resulting string is then appended to the message "Counting words in file ", so that with input COUNT DUCK you'd see "Counting words in file DUCK".

(How did that append take place? Well, "Counting words in file " was a WRITE statement, and WRITE holds the line open for more characters. So IF thischar<>null THEN WRITE (thischar) simply added the characters D,U,C,K to the existing line until a null was encountered. The WRITELN shortly afterward writes a blank line.)

Hereafter when the program says textfile it should mean DUCK, so what the next block does is assign DUCK to textfile, then reset textfile (now=DUCK). RESET means, "make file ready for read operations." The counting loop now starts drawing its data from diskfile DUCK.

The counting loop is actually two nested WHILE loops, the outer lasting till the End of File (EOF), while the inner repeatedly picks its way character by character to an End of Line (EOLN), incrementing count on each valid occasion. Pascal defines EOF and EOLN as "Boolean," i.e., True-or-False; when we say WHILE NOT EOF (textfile) we are really saying, "while EOF (DUCK) is False."

While EOF (DUCK) is False, the EOLN loop can operate. Another Boolean, first, has been set to True (":=" is Pascal's setting operator; unlike BASIC, which uses "=" for both purposes, Pascal keeps "=" for comparisons of equality). IF first THEN BEGIN means, if first is True, go on; and if first is True, i.e., if we are at the left end of a line, and if firstchar is a dot, then we are dealing with a TEXT command line. In that case we go through an If...Then loop which nibbles its way toward EOLN without counting anything. But if firstchar is *not* a dot, then we set first to False (thus skipping that loop) and commence the business of counting.

Counting makes use of Pascal's IN function; here you see Larry Reeve's most cunning improvement on the longer means I'd devised. Consider the line,

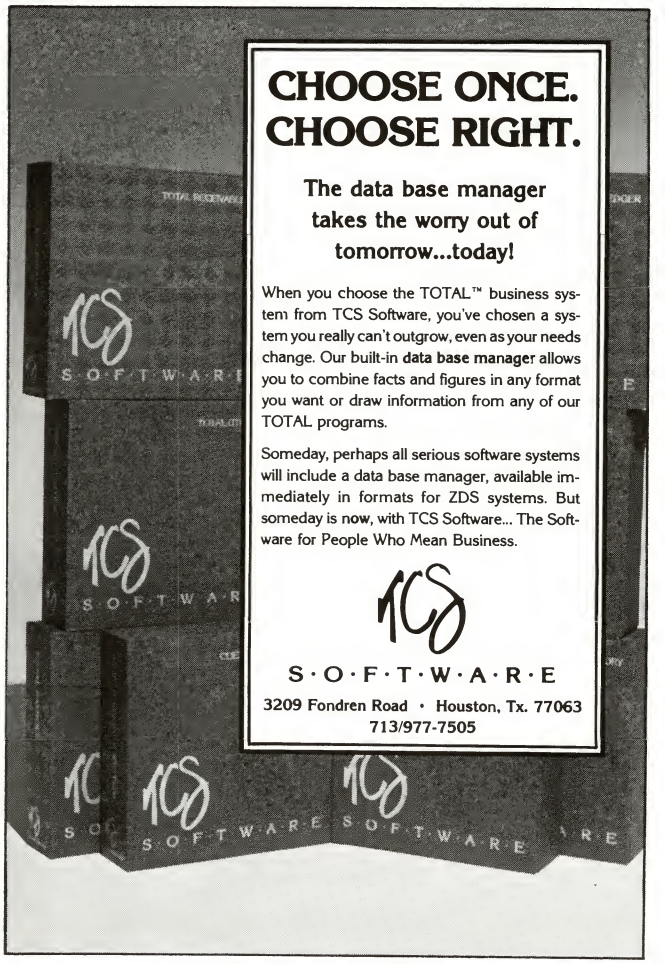
```
IF (thischar IN [' ',tab]) AND NOT (prevchar IN [' ',tab])
```

It says, if the character we are looking at is a space or a tab—possibly a word-division—*and* if the preceding character was not either of these, *then* it is indeed a word-division, so increment the counter. But if the preceding character was also a space or a tab, do nothing. That keeps the COUNT from being "two" just because the space-bar got hit twice. The next conditional skips TEXT's soft hyphens (\–) on the same principle, while counting normally-hyphenated words as two. So, character by character, each line gets put on the screen while its words get counted.

That's all there is to the counting part proper. What remains after each character is to update prevchar, write thischar, and re-start the EOLN loop. When EOLN finally becomes true (end of line!) we prepare to re-start the EOF loop. Our preparation consists of WRITELN (so the next line will start at screen left) and READLN(textfile), which says "start a new line of DUCK." (It does that by setting EOLN to "false," a normal effect of READLN.)

Lucidata is particularly resourceful when confronted by less memory than a program seems to need. It then enters a "paging" mode that can manage impossibilities at the cost of some fairly frantic disk activity.

All this goes on WHILE NOT EOF, and at file's end we exit from the outer loop, write a blank line, and write a line that says "xxxx Words", where xxxx is the present value of count. It's the use of actual words like thischar and count, not BASIC's T$'s and C$'s, that makes a Pascal program, once you catch its rhythm, readable almost like English. You should choose your identifiers with that in mind, bearing in mind too that Lucidata reads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only the first eight characters. And be lavish with comments!

A few things to ponder

The Lucidata manual is lengthy and scrupulous, though here and there tough if you don't know what it's saying already. Much microcomputer documentation has that quality; "documentation" is a word that means "this goes on record for expert scrutiny." A Lucidata Beginners' Supplement is in preparation. Meanwhile, the second disk, a collection of short demo programs and program segments, will answer many questions.

A few things you may want to ponder before ordering. Lucidata's INTEGER range is –32767 to +32767. Its REAL range extends to 1.7E+38 (1.7 times ten to the 38th power, or 17 followed by 37 zeroes!), with accuracy, as I've said, of nine digits or better. It can also handle hexadecimal numbers up to FFFF (which you write $FFFF). Integers from 0 to 255 can be defined as type BYTE for 1-byte representation, a memory-saver. A PACKED ARRAY[1..8] OF CHAR can be defined as type ALFA, also thrifty and a good way for a filing or indexing program to manage short words. Subranges are restricted to type INTEGER, a reduction from The Standard, which permits you to declare a subrange of anything inherently ordered, e.g., the alphabet. If you need a bigger integer range, or double precision, or more subrange flexibility, you need a more expensive Pascal than this one.

Neither Lucidata nor any other implementation I know of gets around one great limitation of Pascal, the need to fix array dimensions when the program is written. With nothing corresponding to BASIC's DIM A(x), you can find yourself reserving whole Hiltons of memory just for safety.

And some tips

A few tips: an array is *undefined*, i.e. possibly cluttered with garbage, until filled, so don't make tests that assume some cells are zero unless you've explicitly zeroed them. A loop counter is likewise undefined the moment its job is done; you can't assume later that it's holding its final value. And, contrary to what you'll read in *Oh! Pascal!*, WRITE in Lucidata's implementation will write immediately, rather than hold things in a buffer for WRITELN to empty. Lucidata's WRITE and WRITELN are exactly analogous to BASIC's PRINT G$; and PRINT G$. Finally, the most common cause of ERROR messages will likely be a missing semicolon, though the ERROR prompt will come somewhat later and not mention semicolons at all. That's because the compiler doesn't know it's in trouble till it's deep into words a missing semicolon has drained of meaning. It will then misconceive the trouble.

(Semicolons get easier if you remember [1] that they are *statement separators*, the compiler paying no attention to the line divisions you insert for the human eye; [2] that an IF...THEN...ELSE sequence however intricate is a *single* statement; and [3] that the END; of a BEGIN ... END; pair is also a statement separator; hence a semicolon before an END is redundant but not hazardous.)

But all languages have their false bottoms. Be grateful to Polybytes/Lucidata for a thoroughly professional, well-supported implementation of the most wondrous orderly language I have encountered. C devotees are entitled to retort that C is orderly too and a lot less garrulous. Just look at the names: one character for six! Adherence is a matter of temperament, partly. In pre-Christian Alexandria, the Pascal and C temperaments called themselves Ciceronian and Senecan respectively.

Speaking of Alexandria, when next you're in Zürich knock discreetly on Prof. Niklaus Wirth's door and leave a handsome offering; no, none of the fluids you were thinking of, though Switzerland has a zesty wine called Dôle. I'd suggest something structured, like a pineapple: a Fibonacci phyllotaxis under central control. Wirth would be the man to appreciate that.

Ordering Information

Lucidata Pascal, version 3.8, $145
TRANSLAT, $15
specify HDOS or CP/M; hard- or soft-sectored 5 1/4" disk; 8" CP/M disk also available
Polybytes
325 - 19th Street S.E.
Cedar Rapids, IA 52403

Also:

Pascal MT+, $350
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7230 Chadbourne Drive
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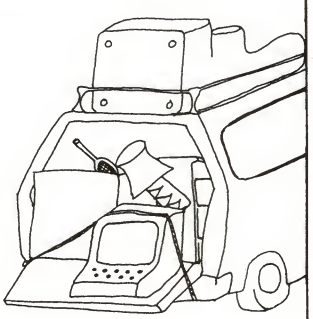

Squeeze More Disk Space Out of HDOS

For the owner of a single drive system, SET HDOS STAND-ALONE may be a useful stopgap to avoid having to purchase a second drive.

Charles E. Cohn

The most glaring limitation of the Heath H89 computer with the Heath Disk Operating System (HDOS) is diskette space. A diskette in the standard built-in drive holds only 100 kilobytes, and nearly half of that is taken up with the operating system. It doesn't take long to run out of diskette space.

Heath sells some outboard 5¼- and 8-inch diskette drives that you can add to the system to get more room, but these cost a bundle. You could also convert to a double-density disk controller, but this is also expensive, and you can't use your 10-hard-sector diskettes.

There is one measure that costs nothing and will greatly increase the diskette space available to you. It makes use of an undocumented feature of HDOS and works either with version 1.6 or 2.0.

This feature is known as "stand-alone" operation. Many enterprising hobbyists have found out how to make use of it. The basic idea is to make more room on the working diskette by removing the operating system files. The operating system is booted up and loaded into memory from a separate system diskette, and then remains in memory while the working diskette is mounted.

You give up some memory space, because the device drivers and operating system overlays remain in memory permanently instead of being swapped in and out by HDOS as needed. This loss amounts to 5,155 bytes (for version 2.0) plus whatever is needed for device drivers above and beyond the disk device driver (which is already in HDOS, anyway). The driver for the Diablo printer, for example, takes an additional 566 bytes. It's not a bad tradeoff, because additional memory (up to a total of 48K) is far, far cheaper than additional disk drives.

Preparation

To use this scheme, you will need one system diskette and one or more working diskettes. The system diskette is prepared as described in the Heath Disk Operating System (HDOS) manual. To prepare a working diskette, first initialize a diskette in the usual manner. Then use ONECOPY to copy the files SYSCMD.SYS and PIP.ABS onto it. The former is needed to interpret keyboard commands, and the latter is needed for executing CAT, COPY, RENAME, and DELETE commands. You will then have 335 sectors left on this diskette. (This compares to the 241 sectors that would be available on a bootable diskette with minimum system files.) If you want to have error messages shown on the screen instead of just error numbers that you have to look up in the manual, you will have to include ERRORMSG.SYS, which takes up 11 sectors.

Your application may also need an editor. (I like the page editor PAGED distributed by the Heath Users' Group.) And you can include any other programs that you will use—a formatter for text processing, ASM.ABS and XREF.ABS for machine-language programming, BASIC.ABS for BASIC programming, etc.

It is a good idea to make up a master working diskette containing these files only. New working diskettes can then be generated very easily by transferring all the files at once with the command *.* to ONECOPY.

How to do it

To use the system, boot up the system disk in the usual way. When the boot is complete, you must first load into memory the drivers for any peripheral devices that you will be using (except for the disk). For example, type LOAD LP: if you will be using a printer.

You then go into stand-alone mode by typing SET HDOS STAND-ALONE. The system will try to scare you off by saying, "It is Now Pitch Dark. If You Proceed, You Will Likely Fall Into a Pit." Ignore that.

On the next prompt, type RESET SY0:. When the computer tells you to, remove the system diskette and insert the working diskette.

(I might interject a possible caution here: when RESET SY0: is executed, the head-load solenoid in the drive remains energized while the diskettes are being changed. On older drives (made by Wangco), this causes the pressure pad to remain pulled in, producing a risk of damage to the pad or the diskette. Therefore, you might instead wish to type the command DISMOUNT SY0:, change disks after the drive shuts off, and then type MOUNT SY0:. However, with my Siemens drive there is no problem, since the door linkage pulls the pressure pad out of the way when the door is opened.)

After the computer completes the mount operations, you will get a prompt. Proceed with your tasks in the normal way.

Once having switched from the system diskette to a working diskette, you can switch to another in the same way. (This is another advantage of the stand-alone mode—you don't have to reboot when you switch diskettes.) If you need some utility, such as ONECOPY, that is not on your working diskette, you can bring back the system diskette in the same way.

Try this and hang onto the money you would have spent for an extra disk drive!

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- Twice the number of expansion slots (Six)
- Real time clock on-board
- Two serial I/O Ports
- Designed for multi-user capability
- Parity checking for RAM assures integrity of memory transfer operations
- Arithmetic processor provision facilitates mathematic operations

These features, along with an enhanced monitor to access to all the Z80 CPU, give you power from your 88-89 that only large computers can claim.

High Speed Processing

The Super 89 runs twice as fast as the standard H/Z CPU board. Time savings on running programs are significant.

Expanded Memory Capacity

This feature allows you to use the advantages of the more sophisticated programming languages; enables you to use enhanced memory software such as print spoolers and electronic disks to increase speed; allows the use of "scratch pad" memory to increase efficiency; the bank select features give you high speed data handling and manipulation; and provide for multi user capabilities.

Peripheral Expansion

This important features lets you use your Super 89 in more ways with peripherals from DG, Heath and many other manufacturers. Some of these important enhancements are: Additional floppy disk controllers; Modem or Printer serial interfaces; Color video controllers; IEEE 488 BUS for test equipment and measuring interface; Analog/Digital interface; Parallel interface for high speed printers; Hard disk system controllers; Bread-board development cards; Computer game controllers; and Production process controllers.

Real Time Clock

The Real Time Clock allows you to program activities and control functions according to time; allows the use of interactive time functions with an electronic disk; and is very useful in accounting functions.

Parity Checking

This features ensures the integrity of memory transfer operations. The Super 89 alerts you if a parity error occurs.

Full CP/M and HDOS Compatibility

The Super 89 has full compatibility with either the HDOS or CP/M disk operating systems that does not require hardware modifications. This feature gives you the best of both worlds in the amount of existing software you may use.

Arithmetic Processor Provision

The Super 89 has on-board provisions for the optional AM9511A. This is a separate processor that features basic arithmetic as well as exponential, logarithmic, trigonometric and binary functions. Calculations are high speed and can be accomplished as a "hardware subroutine". This device is a must for anyone using any amount of mathematical computation whether complex functions or arithmetic calculations.

Ease of Installation

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This optional software package for the Heath/Zenith CP/M 2.2.03 allows the Super 89 user to access auxiliary RAM as a very fast mass storage device. Provides up to 180K bytes of storage area that is accessable without the slowness of disk drives. The Electronic Disk also includes display capability for the Real Time Clock.

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Circle #114 on Reader Service Card

Taking a Look at Magnolia's Invisible Disk

One strategy for faster disk access is semiconductor memory viewed by the operating system as another disk drive.

Hal Glatzer

Microcomputer software can run very slowly if it has to go back and forth to the disks, reading and writing, reading and writing.... Sorting routines, data-base managers, spelling checkers, and other programs with a lot of input/output (I/O) tying up their time are "I/O-bound." Their speed of completion is dependent upon the speed of disk access. And the only remedy is to attach a faster disk system.

A hard disk system runs faster than a floppy disk does, but is also very expensive. For people on a tight budget, and for people who want to free their disks for storage instead of I/O duty, there is another alternative: a printed circuit board filled with semiconductor random-access memory (RAM) that the operating system treats *as if it were a disk drive.*

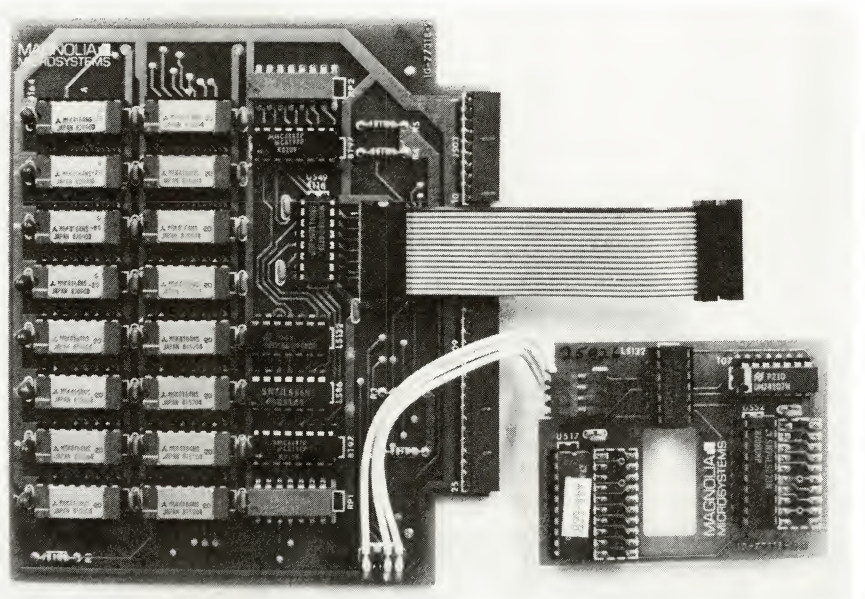

Photo Courtesy of Magnolia Microsystems, Inc.

It may not look like one to *you*, but to HDOS and CP/M, this looks like a disk drive.

Fooling the operating system

The CP/M operating system regards every disk drive as a "logical" device—that is, it deals with it according to built-in rules and does not care whether or not there is a "physical" disk drive out there, as long as it behaves the way it is "supposed" to. A logical drive running under CP/M will accept data for storage, send acknowledgements back to the central processor unit (CPU), respond to its "name" (e.g., A:, B:), and so on. So we can "fool" CP/M into thinking that a printed circuit board full of RAM chips is a disk drive because we users "configure" CP/M: we dictate what devices are attached to the computer and where they will be found.

Why use a logical drive instead of the "real thing"? Because it runs up to 100 times faster than the fastest disk drive can. An "electronic disk" can manipulate files or sort rapidly through large data bases, such as mailing lists. Programs like Spellguard or dBASE II, which are inherently I/O-bound, will run in half the time they take on a floppy disk.

Another use for it is in making distribution copies of software: a publisher loads programs into an electronic disk and makes duplicate floppy disks from *that* copy instead of from the original disk, greatly reducing the chance of physical damage or copying errors from repeated handling and head abrasion.

Magnolia Microsystems, Inc., of Seattle, makes a 128K RAM board for the Heath/Zenith '89 and '90 microcomputers. It comes with instructions for using it with CP/M as an "invisible disk." (That's Magnolia's name for it.) To be honest, as a reviewer, I should state here that I have bought all of my Zenith equipment from Magnolia, and that I have occasionally helped them write news releases and product advertisements. Nonetheless, I am a self-employed writer, not a computer whiz, and my experience installing and using the invisible disk is comparable to that of strictly non-technical users. I have always been impressed with Magnolia's products, but I must admit that there are some limitations to the invisible disk that are inherent in the idea itself, and which Magnolia—for all their savvy—was not able to overcome.

Opening up your '89

First, the installation: it is fairly easy. I am not handy with tools, though I have a healthy curiosity about electronics and computers and some minor kit-building experience left over from childhood. But I had never before opened the back of my '89 to poke around with a screwdriver—not even to flip the DIP-switches to configure my terminal. So I was not happy to learn that the invisible disk required me to dismount the CPU board, remove a control chip and the 16K RAM expansion board, plug in the 128K RAM board, and run a software check on the new equipment. It seemed like a lot of work but, to my surprise, it took less than an hour—including some troubleshooting.

Magnolia's pamphlet of instructions is easy to read; the steps are short and logical. Illustrations give a very clear picture of what has to be done, and what it'll all look like when it's finished. There is a systematic checklist of everything that might be wrong, in case the system doesn't work when it's turned back on. (In my case, I had mis-aligned a plug-in connector.) When the familiar "beep-beep" sounded, and the H:–prompt appeared, I was able to run the monitor RAM test that comes on a floppy disk supplied with the kit. Then I followed Magnolia's instructions for "linking" the

drive to CP/M, a new procedure for me but one that made sense as I did it.

The original '89s are 48K machines. They're brought up to their full 64K potential by adding a 16K RAM expansion board (factory-installed with the '90s). But when you install an invisible disk, it's a 128K RAM board that *replaces* the 16K RAM expansion board. In other words, you don't get 128K of storage in the invisible disk. You get 112K—of which about 2K is needed for formatting, etc., just as in a real disk. Think of this analogy: when you tie two sticks together to make one long one, you have to overlap them, and the combined length is shorter than the sum of the lengths of the two original sticks.

So the invisible disk—ready to use—is the equivalent of a 110K disk drive. That's really not very much storage; it's only slightly bigger than the single-sided, single-density hard-sector 5¼-inch disk drive that comes with the Heath/Zenith computers as standard equipment. It has nowhere near the capacity of even a single-sided single-density 8-inch disk. But of course, what it lacks in size it makes up for in speed. (As an example, running Spellguard on this article took 66 seconds using my floppy disk drive. Using Magnolia's invisible disk, it took 35 seconds.)

Along with the invisible disk, I updated to Magnolia's latest release of CP/M. I now use SETAUTO, which lets you take a single line of instructions to the operating system and store it on the booting disk. The instructions will be executed as soon as CP/M is booted. I told it to copy all the files from the booting disk (A:) to the invisible disk (C:). (The command line is: PIP C:=A:*.*) That way, when I boot up the system, my word processing software and a few utilities are automatically loaded into the invisible disk. I just type "C:" and touch RETURN to get my C>–prompt, and I'm working through the invisible disk. Then I can put file disks into drives A: and B:.

A couple of caveats

So what's the bad news? First of all, the invisible disk costs about $595, which is similar to the cost of a floppy disk drive with comparable capacity.

Second, you must always remember that semiconductor RAM is *volatile*: whatever is stored in it will disappear forever when the power is turned off, so if the invisible disk has valuable data or files in it, you must copy them onto a floppy disk and remove it before switching the machine off. Third, the invisible disk is a "logical drive," not a *real* one; some disk utilities, such as ONECOPY, or diagnostic utilities that examine every track, simply will not work with a RAM board.

As I said, even Magnolia could not overcome these physical limitations. What you get for $595 is a very fast disk drive equivalent. It turns a two-drive system into a three-drive system without filling the third port in the hard-sector controller card. It does not affect *any* disk controller, in fact, and is always available no matter what other drives are hung on the computer.

By the way, Ultimeth Corporation makes an HDOS package for Magnolia's invisible disk, so people who like HDOS needn't feel left out.

If your programs or files are getting I/O-bound, perhaps an invisible disk will speed things up for you. It works for me.

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Circle #154 on Reader Service Card

Passwords and Record-Keeping: One School's Solution

The modular form of this assembly language system makes its modification considerably easier.

James A. Ingram

Four years ago, computer education arrived at the Broken Bow, Nebraska, Senior High School. When the school's new H8 was placed in service complete with cassette units and the old H9 terminal, a primary objective was writing software for keeping track of who used the equipment, when, and for how long. Since a major portion of the funds for the project came from a grant from the Federal government, this record-keeping was specified as part of the grant's evaluation criteria.

I must have been looking at the world through green-phosphor glasses. Ignorance certainly was bliss, because my students and I had fun discovering that we didn't have the foggiest idea about how to develop such software. As the Heath line of products grew (and as our phone bills to Heath grew), we grew, too. The program described here was developed for use under the Heath Disk Operating System (HDOS). It's the outgrowth of four years of aggressive learning, and its history of development parallels my own growing programming skills in several languages, first BASIC, then C/80, Pascal, and now assembly language.

A simple system

The classroom setting here in Broken Bow doesn't require a high-level security system such as found on mainframe computers; actually, file space and the speed of the central processing unit (CPU) both place restrictions on security system size and features. The system described here provides no individual file security, and no "access levels." Once users have successfully logged on, they have access to all normal HDOS features and all files on all available disks. It's up to the user also to be sure that the system is properly secured when leaving the data processing lab. All of this takes place under the watchful eye of the instructor in a classroom adjacent to the computer lab. Sensitive files are simply kept on disks to which the students have no access. (In other words, they're locked up in my desk!)

The requirements for such a security system in a secondary school environment are simple:

1. Simulate the conversational style of security systems that students will encounter on larger computers after leaving high school.
2. Provide all students with their own individual passwords.
3. Display an easily updated greeting to the student upon successful entry to the system.
4. Record the password, date, and log-on and log-off times in a users file for every entry into the system.
5. Prevent students from breaking through the security system to obtain unrecorded computer access.
6. Be available at the operating-system level so security is language-independent, and so that the user has access to the entire operating system once logged on.
7. Be as small as possible in order to conserve space on the Primary System disk. (In our case, it already contains Microsoft BASIC, PIE, DDFORMAT, INIT, Tiny Pascal, and the usual system files, all in less than 100K.)

Once users have successfully logged on, they have access to all normal HDOS features and all files on all available disks.

Since I felt that the security system had some potential for sale to other Heath/Zenith users, I made it independent of machine size. Furthermore, it can be altered and reassembled by anyone who has had the foresight to purchase HDOS with their H8 or H89, since HDOS comes with an assembler (ASM). The program is written in 8080A code, so it is compatible with any system running HDOS 2.0. A simple one-line change (revealed in the documentation provided with the program) can make it compatible with earlier versions of HDOS, as well.

How it works

Under control of the security system, the terminal displays the prompt "ENTER PASSWORD (will not appear on screen)". Students type in their passwords and press the return key. If the password is invalid, the screen will display the message "Illegal Entry Attempted—Invalid Password" for a few seconds, and then reset to the original prompt. There is no penalty for endlessly trying invalid passwords (other than wasting time); with passwords made up of any combination of any five valid ASCII characters including some control codes, the number of possibilities is nearly endless. The password structure can be altered at assembly time to increase the difficulty of finding passwords by chance, too. The characters of the password do not appear on the screen during entry, so that sneaky observers can't obtain a password by peeking over the user's shoulder.

All methods of exiting from HDOS-environment programs have been blocked, including Control–D, Control–C, and even Control–ZZ. When a valid password is entered, all of these functions are restored to their normal operations.

When the password has been verified, a bulletin-board style text file is displayed on the screen. This is simply a file created with a text editor by the instructor. To prevent it from being printed on the screen with the Primary System catalog, it has an "S" flag. (Since our students usually find the HDOS manual well above their level of understanding, I have authored a simplified "how-to" HDOS guide which omits some of the advanced features of HDOS such as CAT/S and CAT/ALL; hence, files with S flags usually remain secret.)

While the student is reading the bulletin board, the security system is tying up loose ends. It appends the password just entered, the date, and the time to a record file which also has an S

flag. With these tasks complete, the system drops out to HDOS, leaving the computer as an ordinary H8.

When lessons and activities are complete, the student simply types LOGOFF and presses the return key while in HDOS. The system appends the current time to the last entry in the record file and then links back to the program containing the initial "ENTER PASSWORD" prompt, secured and ready for the next user.

The daily routine

The daily routine begins when the instructor arrives and turns on the equipment. The normal boot procedure is followed, entering the correct date. The boot routine automatically looks for a prologue program which loads the line printer and clock drivers, and then invokes the security system. This procedure is performed only once at the start of the day, and students are not authorized to boot the system. Few students comprehend the procedure anyway, since we are still using the original H8 ROMs which require a lengthy series of keystrokes on the H8 front panel. If students crash the operating system, they must get the instructor or a data processing aide to re-boot the system. If you are using the H89, the automatic nature of the prologue file still assures some degree of security, as long as students are not aware of the HDOS options available at boot time.

If changes need to be made to the bulletin board or the record file, the instructor logs on with his own password and does the necessary work. The clock can be set to actual clock time (rather than 00:00:00) at this time, too.

If a new student needs access to the system, the instructor consults a printed copy of the latest version of the source code to find an available password. The password is copied onto a wallet card for the student. The student's name is then noted on the master copy, and it is stored away in a safe place again.

Incidentally, new students are assigned to experienced users for a period of two weeks, after which they must pass a written exam on the basic features of HDOS and the hardware at the 100% level before being issued a password. In addition, unless they are enrolled currently in a data processing class and have an assigned lab time, they must obtain a teacher's release signed by every teacher which certifies that the student is working at a reasonable level in every class. These release forms must be periodically renewed, as when report cards come out. Furthermore, the release form can be revoked by any single teacher at any time.

Everybody is happy with these requirements. The kids are proud of their achievement when they receive that special "ticket," and they've worked hard to earn it. The other teachers are happy, since they have control over kids who would play computer games at the expense of homework. And I'm happy because I know that the kids with access to the system are well qualified and are serious about personal computing.

If the passwords become too well known, or a password needs to be revoked, the assembly language (.ASM) version of the program is edited and reassembled. This isn't as bad as it may seem—the whole assembly process takes about five minutes. We do this on a regular basis every school quarter as a matter of principle.

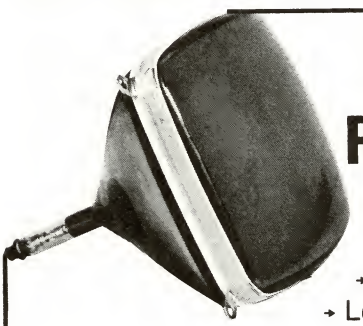
The computer remains on all day. Each time a student logs on, a new record is added to the records file. By the end of the day, the records file may have grown considerably. The file is copied to a storage disk by the instructor, and then the original file is simply edited to remove all records except the column headings. Alternately, the instructor may simply make a printed copy of the file before editing. Finally, the instructor executes a normal BYE command from HDOS, removes the disks, shuts off the equipment, and (hopefully) goes home for the day (night?).

The program

The system to accomplish these tasks is actually a collection of five programs and two files. The bulletin board file (BULLETIN.TXT) and the records file (USERS.TXT) are both simple ASCII files, discussed above. The hard work is done by two programs, SECURE.ABS and LOGOFF.ABS. SECURE is responsible for all activity surrounding attempted entries to the system. LOGOFF is used when the student is finished. In order to keep track of time, the system must include one of the clock drivers and time-setting programs available for Heath equipment. They are not included with the system, but can be obtained from the Heath Users' Group or entered by hand from issues 20 and 22 of *REMark* magazine (September and November, 1981). They are usually named CK.DVD and TIME.ABS. The fifth program is the PROLOGUE.ABS file.

Rather than include all 550 or so lines of .ASM code in this article, I have only presented the comments from the programs. This allows you to duplicate the program in the language of your choice (as long as an executable [.ABS] module is produced so that HDOS can execute it directly from the operating system level). The following discussion deals specifically with the .ASM version, which is available from the address at the end of the article.

To implement the system, a text editor is used to alter the source code where the label TABLE is found, inserting your own choices of passwords in the list. Passwords must be five characters in



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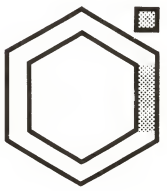

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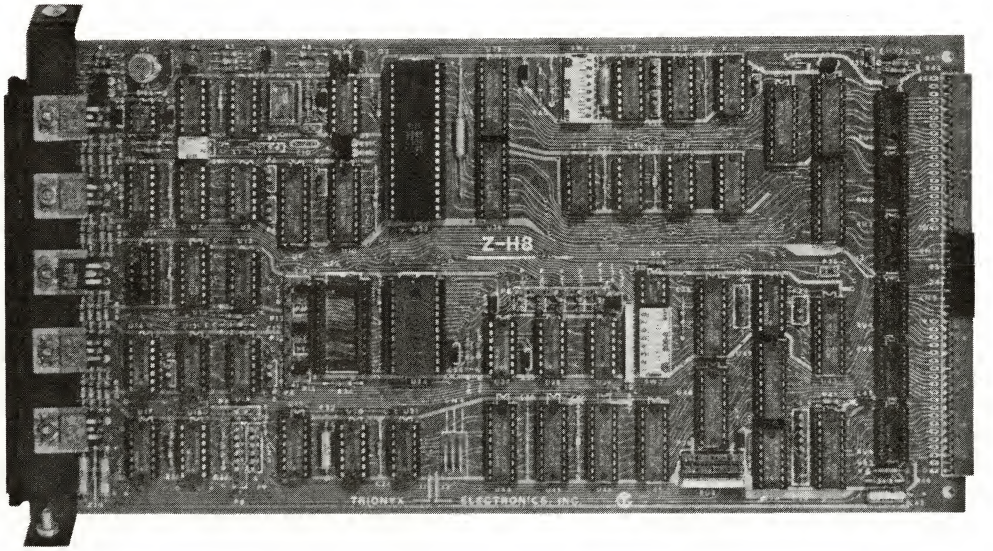

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```
***     Clear the screen and print the 'ENTER PASSWORD' prompt.
***     Turn off the echo, but leave terminal in buffered line mode.
***     Suspend Control-ZZ processing by
        **      finding the CTRL-Z routine 2470 bytes down from HIMEM,
        **      and plugging in a null in place of 26.
***     Get the user's password and check it:
        **      If
                *       Newline character is prior to five characters
                *       or more than five characters long,
        **      then
                *       exit to the reject routine.
        **      Call the password table subroutine.
        **      If
                *       password is not found,
                then
                *       exit to the reject routine.
***     Restore the Control-ZZ by putting the 26 back.
***     Print the Bulletin Board by
        **      opening BULLETIN.TXT for reading,
        **      transferring it to the screen,
        **      and closing the file.
***     Record the password, date, and time in the users file by
        **      getting the time from CK:,
        **      opening USERS.TXT for update,
        **      finding the last sector of the file,
        **      reading in the last sector,
        **      and finding the first null character in the sector.
        **      If
                *       there's no room for another record,
                then
                *       move the sector cursor to the next sector on
                        the disk (the new 'last sector').
                *       clear the file buffer in memory,
                *       and reset to the beginning of the buffer.
        **      Copy the entered password into the buffer,
        **      follow it with a space character,
        **      copy the date from 8383 to 8391 into the buffer,
        **      follow it with a space character,
        **      and copy the time into the buffer.
        **      Reposition the sector cursor over the 'last sector'
        **      write the buffer out to the disk,
        **      and close the users file.
***     Exit to HDOS

***     Password table checking routine:
        **      Look at the beginning of the table.
        **      While there are more table entries or no match is found
                *       Check the user's password against the table.
        **      Return to the main program.

***     Rejected Password Routine:
        **      Display 'Illegal Entry Attempted' and pause.
        **      Clear the screen and reprint 'ENTER PASSWORD' prompt.
        **      Go back to 'Get user's password' point.

***     Valid Password Table:
        TABLE   DB      'AAAAA'
                .         .
                DB      'ZZZZZ'
                DB      0
```

Listing 1: Comment lines from SECURE.ASM to show its structure.

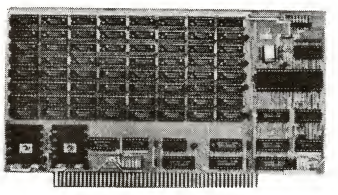
length and may consist of any valid ASCII codes. The end of the table must be denoted by a null character. After the changes have been made, the source code is assembled using ASM according to the directions in the HDOS manual. The SECURE.ABS program is then placed on the Primary System disk, and the source code is tucked safely away on some private disk.

Create the prologue file which loads CK: and LP: and links to the SECURE.ABS program. If you have SYSMOD, you can create it with the DOCOM command; otherwise refer to the HDOS manual for an .ASM example of a prologue file.

The BULLETIN.TXT file is created on the Primary System disk with any ASCII text editing program such as EDIT or PIE. It may be any length, but to fit on the screen without scrolling it should be limited to about 18 lines. It must exist on the disk before running SECURE.ABS, or an error message will be generated.

The USERS.TXT file must also exist on the Primary System volume prior to running SECURE. It is created with the text editor as well; a simple title line or column headings will suffice. Keep the line length at 33 characters, the record length that SECURE looks for in the file. This file holds seven entries per sector (10 if you don't append the log-off time to each record), so it can grow quickly. Periodically copy the file to another disk, and then use the text editor to erase all entries except the headings. Since the data in the USERS file always falls in the same columns, you can even write a series of programs to analyze the data (associate names with passwords, etc.).

The LOGOFF program should be compiled from its source code and placed on the Primary System disk. There are no changes necessary in this program, since its only function is to read the clock and append the time to the last entry of the USERS file. In addition, since all of these programs must be located on the SY0: drive in our system, any disks which might be RESET into SY0: carry a different version of



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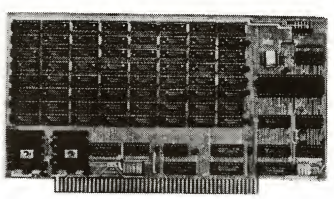

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LOGOFF.ABS. Triggered by an attempt to log off with an improper disk in the SY0: drive, its only function is to print a message telling the user to put the Primary System disk back in the SY0: drive so that the proper files will be present for logging off.

The HUG clock driver (CK.DVD) and its time-setting program (TIME.ABS) (or their equivalents) must also be resident on the Primary System disk. Copy or assemble them from your own sources.

To review, the full system requires five programs to be resident on the Primary System disk: (1) SECURE.ABS, (2) LOGOFF.ABS, (3) CK.DVD, (4) TIME.ABS, and (5) PROLOGUE.ABS. Two text files, USERS-.TXT and BULLETIN.TXT, must also exist on the Primary System disk.

Versatility derived from modular form

This security system is written in modules, and you can generate the full system or only part of it at assembly time. The simplest system eliminates USERS-.TXT and BULLETIN.TXT, CK: and TIME.ABS, PROLOGUE.ABS, and LOGOFF.ABS. The source code for SECURE.ABS is edited to eliminate all blocks related to recording user information and all references to the bulletin board. And the password list is shortened to a single word. The resulting version of SECURE.ABS is a password "turnkey" access system, short and fast. The computer will not accept an invalid password; when a valid password is entered, the user has immediate access to HDOS. When users finish their work, they type SECURE instead of LOGOFF to re-secure the system against unauthorized users. (Alternately, the program can be named LOGOFF.ABS instead of SECURE.ABS at assembly time, so it is invoked by typing LOGOFF.)

The bulletin board modules can be added back into the simplified system described above to provide some communication to the user, such as a brief description of HDOS commands available and their function. Or the bulletin board functions could be left out and the user record file modules incorporated. This of course requires the presence of USERS.TXT again. Remember also to expand the password table again.

Obviously, both the bulletin board and user record features could be incorporated. Still the LOGOFF.ABS program would not be needed; the record file would simply reflect the log-on time instead of both log-on and log-off times. As in the simplest version, SECURE.ABS should probably be renamed LOGOFF.ABS at assembly time.

Conclusion

There are many possibilities for improvement, but up to now we have found the system presented here to be sufficient for the majority of our students. The very few who are able to go beyond the security afforded by the system must learn more than the average student about the internal workings of the computer and about the advanced features of HDOS. (Including learning to read the HDOS manuals!) In an educational setting, the system's shortcomings provide a sort of reverse incentive toward more detailed knowledge of computers and computing. ("Getting around the system" poses certain ethical problems—are they going to do the same thing with every computer system they encounter, regardless of other people's rights? But it seems the better part of wisdom to recognize that it's going to take place and to encourage students to work with the goals of learning and problem-solving rather than putting something over on someone else.)

Probably the biggest drawback of the system is the easy availability of the passwords by simply viewing the USERS.TXT file; note however that control codes may be incorporated into the passwords, and will not appear on the screen or printer during a listing of the file. Note also that the only viable "fix" for this problem is genuine individual file security, which would involve extensive modification to HDOS itself. In our situation, that's overkill. Another possibility which we're investigating now is the association of a record number with each password that "points" to the user's name in still another text file; this is the name that would be appended to the record file.

All in all, the development of the system has presented a challenge and a real opportunity for growth, and it appears to have quite a bit of potential even yet. I hope that the ideas and programs described here will be of use to you, whatever your security needs might be. Happy computing under your SECURE-ity blanket!

Ordering Information

The author has completed an improved version of his security system since the article above was written. It now includes a menu-driven maintenance program which allows adoption of new passwords and revocation of existing passwords without reassembly. Also, passwords no longer appear anywhere on the disk used by the students.

Printed copies of the source code for SECURE.ABS and LOGOFF.ABS are available for $10.

The source code, documentation, sample assembled programs (not including CK: and TIME which you must furnish), and support files are available on disk (original Heath 100K format) for $19.95.

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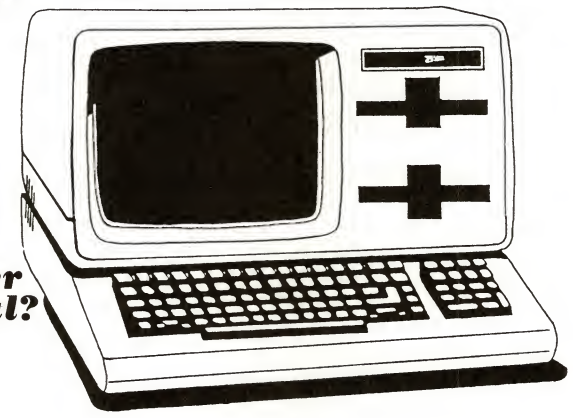

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Hillary's in a good position to know about Waldo, because her mother, Shelley Launey, works on marketing for Artra, and her father, Reuel Launey, is head of software development, head of hardware development, and president of the company.

What *is* Waldo? In terms of hardware, Waldo is a multifunction peripheral which includes a 24-hour clock/calendar; two AY–3–8910 sound synthesizers; a BSR X–10 home control interface; Housemaster voice/time control software, with voice recognition plus 15 additional programs; and a 90-page operating manual. The Waldo circuit board plugs into an I/O slot in the rear of your H/Z89 microcomputer.

Several significant options are available. There's a battery backup for the clock/calendar, so it can be kept running continuously. Dual RS–232 ports are also available to allow the user to interface Waldo with peripherals which use the RS–232 serial data transmission protocol.

There are also two different voice synthesis modules. VOICEMOD–1 uses a Votrax SC–01 integrated circuit to combine any of 64 phonemes, the basic units of speech. This module is versatile—you can program Waldo to say almost anything—but the voice *sounds* like a computer. VOICEMOD–2, on the other hand, uses a vocabulary of only 206 words, built into a read-only memory (ROM) chip, to provide a limited range of very human-sounding speech. Only one module at a time can plug into the Waldo circuit board.

(The basic Waldo unit is available both in kit form and assembled. For prices, see ordering information below.)

Waldo's functions

What can Waldo *do* with all this? For starters, the clock/calendar enables you to control your computer with preset timed instructions. The battery back-up for the clock/calendar means that Waldo can still keep track of the time even when there's a power outage.

Waldo's BSR X–10 home controller interface plugs directly into your home wiring system, through which it sends control signals to "modules" which plug into each wall outlet. You simply plug your lights and appliances into the appropriate modules. Then Waldo "talks" to the BSR via an ultrasonic interface. From your '89 keyboard, you can directly control any light or appliance which is plugged into the BSR modules. Thanks to Waldo's clock/calendar, you can leave your house for a vacation,

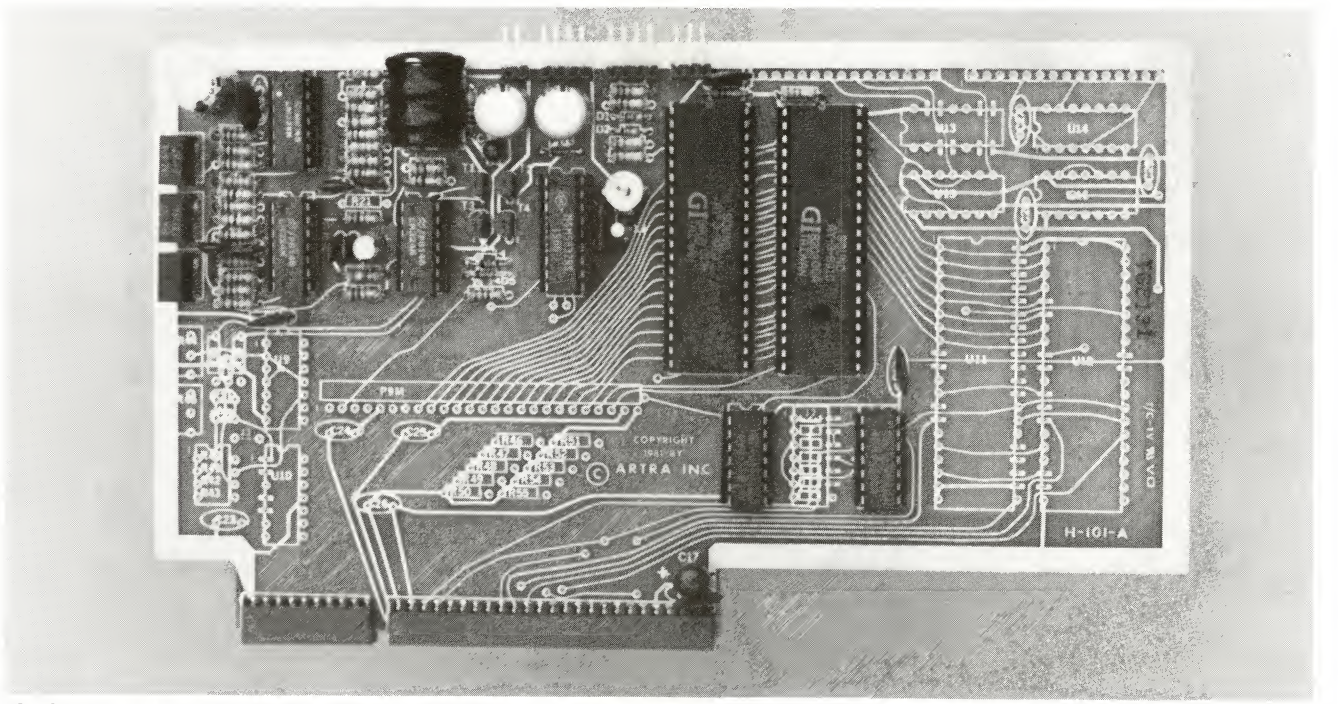

Photo Courtesy of Artra, Inc.

The basic Waldo integrated circuit board plugs into an I/O slot in the rear of your H/Z89, enabling it to remotely control home appliances. Note the two large AY-3-8910 sound synthesizer chips in the center of the board, and the MSM5832 clock/calendar chip immediately to their left. You can put RS-232 serial communications circuitry in the open space to the right of the sound chips. You may also install a voice synthesis module (either VOICEMOD-1 or VOICEMOD-2) in the open space on the lower left part of the board.

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and Waldo will use the BSR to turn lights and appliances on and off at the appropriate times. Because Waldo's software is running on your '89, "sets" of home control commands can be saved on disk. This means that once you've found a satisfactory way for Waldo to simulate a human presence in the home, you can save a file called "VACATION," and then just call that file up whenever you go away.

Waldo's voice-recognition software provides some exciting capabilities. You can control lights and appliances from anywhere in the house, in response to a simple voice command from any microphone linked up to Waldo. The entertainment potential is obvious. But there's also a "convenience value" to Waldo. It seems almost sinfully luxurious to lie snug in bed and say, "Turn off the back porch light, there's a good chap," (or words to that effect). However, such luxurious applications are routine for Waldo.

Either voice-synthesis module, in conjunction with Waldo's clock/calendar, can give you a talking clock: "The time is eleven-fifteen." Of course, that's by no means all that Waldo can say. The phoneme-based synthesizer, VOICEMOD-1, can be programmed to say any words in the English language, on command from the Housemaster software. Only one caveat: programming the proper sequence of phonemes is a job which requires some effort. However, Artra says that by the time you read this article, they will probably have text-to-speech software available for VOICEMOD-1. For a price "in the area of forty dollars," you'll be able simply to type in the words you want Waldo to say.

VOICEMOD-2, the high-quality speech synthesizer, is limited to a vocabulary of 206 words selected by the manufacturer, Texas Instruments. Many of the words included are particularly useful in a technical context: "on," "off," "right," "left," "danger," "check," "switch," the numbers, the letters of the alphabet, and the phonetic alphabet ("alpha," "bravo," "charlie," "delta,"

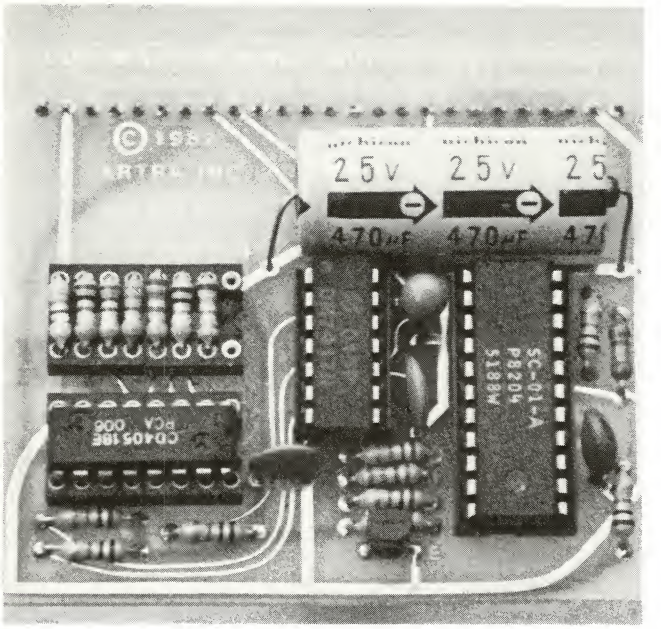
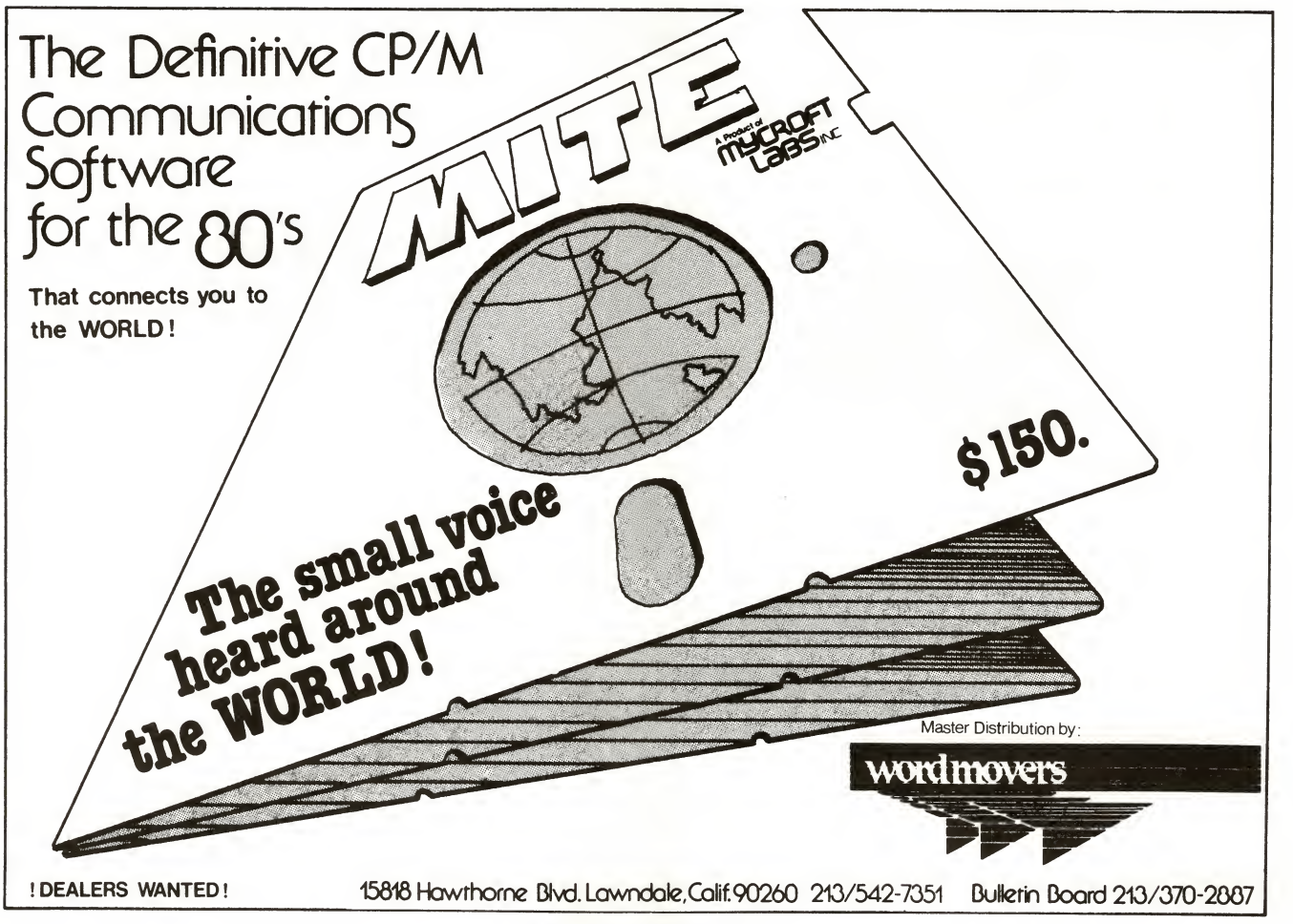


Photo Courtesy of Artra, Inc.

The Waldo VOICEMOD-1 module, designed around the Votrax SC-01 integrated circuit on the right of the card, can synthesize almost any word in the English language, using 64 "phonemes," the basic units of speech. Only one catch: Waldo speaks with a slight "computerese" accent.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and so on). Essentially, these are words that a machine-controlling computer might want to say to a person. The vocabulary is large enough for quite a few useful applications.

Combining voice-recognition and voice-synthesis can be highly entertaining. For example, you can set Waldo up to create an illusion which will deceive many

You can program Waldo to say almost anything—but the voice sounds like a computer.

people into believing you have an "intelligent" computer. "Waldo, how much is twenty-nine plus twenty-seven?" you can ask, and Waldo will promptly tell you, "Twenty-nine plus twenty-seven equals fifty-six." Of course, Waldo isn't actually computing that arithmetic; it's just responding to a "signature," a particular sequence of words. If you had programmed it, Waldo could have just as easily responded to that signature by saying "Twenty-nine plus twenty-seven equals eighty-three," or by turning off the lights. (Although your guests would probably have enjoyed that less.)

Other enjoyable applications are possible. It should be possible to write or adapt Adventure-type game programs so that the player's interaction with the computer would be verbal as well as textual. In Adventure you "move" through an underground "dungeon" by giving the computer simple commands. You might say, "Go west ten yards." Then you'd hear the computer say, "You enter a room which contains a

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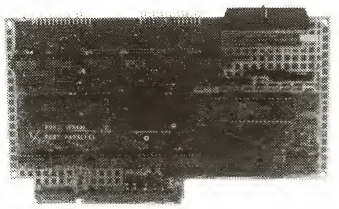

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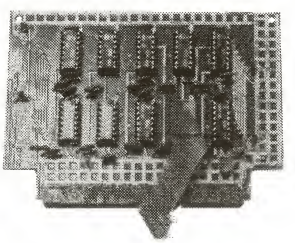

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purple dragon. What do you do?" It would be fun for the purple dragon, too.

With sufficient programming expertise and time, it would also be possible to create some powerful voice-interactive computer-aided instruction (CAI) software. Waldo can serve as part of a computer system to aid a handicapped person. Voice recognition and synthesis capabilities are very valuable to people who have difficulty using a computer keyboard. Reuel Launey is interested in using Waldo to help handicapped people. Last fall, the Heath Users' Group of New Jersey (HUGNJ) raised the funds to give two '89 systems, complete with educational software, to the Cerebral Palsy Association school in Middlesex County, New Jersey. Launey provided HUGNJ with a Waldo unit and its Housemaster voice synthesis/recognition software, at cost.

Waldo in action

I didn't have time to see all Waldo's functions in operation when I visited Artra for an afternoon of interviews and demonstrations. But Launey did show me something of Waldo's voice recognition capabilities. I was impressed with how quickly you can get Waldo to recognize voice commands. It took me only an hour or so to get the hang of it.

Waldo can recognize up to 24 voice "signatures." A signature can be any spoken phrase, short or long: "Emergency," "Turn the lamp on," "Prepare the house for vacation," "I came to Casablanca for the waters." The content of the words is not important—just the sound. You should avoid using signatures which sound closely similar to each other. "Turn the lamp on" differs from "Turn the lamp off" by only *one* syllable. A better pair of signatures would be "Turn the lamp on" and "Turn off the lamp," where only the first syllable is the same.

The actual mechanics of recording a voice signature are quite straightforward. You load up Waldo's

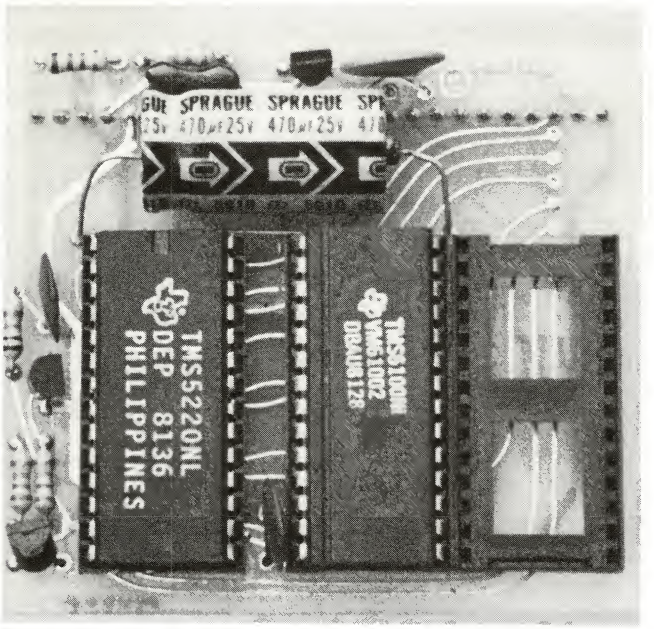

Photo Courtesy of Artra, Inc.

VOICE-MOD 2 allows Waldo to say a limited number of words (206) in an almost perfectly human voice. The Texas Instruments TMS5220 integrated circuit, on the left of the card, processes digital speech data stored on the 128K ROM TMS61002 chip, on the right.

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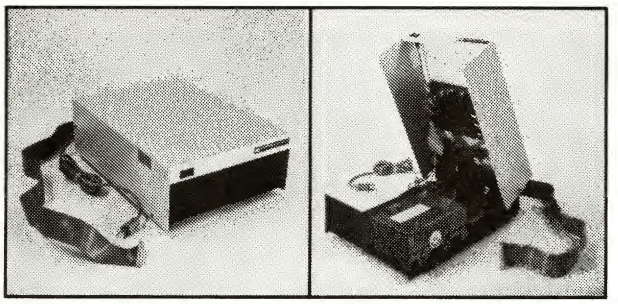

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Housemaster program. It's menu-driven, so you just choose the appropriate options until you arrive at the signature-recording module. At that point, a message will scroll across the screen, telling you when Waldo's ready to record your voice.

When you are recording a signature, everything else in the room must be quiet, or the microphone will interpret extraneous sounds as the beginning of a phrase. Once all is silent, you simply say your signature—a shade louder than normal conversational level—and let Waldo do the rest. The Housemaster program will display on the screen several lines of two-digit numbers. If there are a lot of numbers in the teens and twenties, you've got a good signature.

It takes a little practice to record a signature correctly. When I tried it, the first few attempts weren't any good. I didn't at first understand how sensitive Waldo was. When it was time for me to speak my phrase, I'd lean forward, say the words in my normal conversational mumble, and then lean back to watch the results. Here's the catch—as I leaned back in my chair, my arm slithered over my sweater and made a very soft sound. Of course, the normal human ear simply ignores such sounds. You have to concentrate in order to hear them at all, but Waldo doesn't know any better. So we saw a curious pattern in the numbers Waldo displayed.

The last row looked something like this:

... 15 08 19 13 14 00 00 00 00 00 07 09 04 05

The zeros meant silence; but the 07-09-04-05 string at the end showed that Waldo had incorporated the slithering sound into the voice recognition signature. To get Waldo to recognize the phrase again, I'd have to add

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the sound of my arm slipping across my sweater—and I'd have to time it just right, so there would be the same length of silence each time.

I did eventually learn how to sit still long enough to record a good signature. Finally, I said, "Turn the lamp off," and, after a slight pause, the light on Launey's desk dimmed and went dark. I felt confident after my session with Waldo that, given a bit of time, I could master the trick of recording a reliable signature.

I should emphasize that this process of trial-and-error continues *after* recording a signature. Artra's documentation states, "It is important to realize that Housemaster is not a foolproof voice recognition system." Launey writes, "After a few hours of experimenting with different phrases, you'll get to understand exactly how to design a complete set of 24 recognizable meaningful phrases which will function with 90% reliability or better from across the room."

One reader of *Buss: The Independent Newsletter of Heath Co. Computers* reported that he has had difficulty achieving such reliability. Reno Pittman of Chicago, Illinois, wrote, "I did expect it to perform as claimed with 24 distinct phrases and 80 to 95 percent recognition. For testing purposes, I used all the examples in the documentation ... On the average I've found that in a quiet environment recognition was at about 70%, and in an environment with some background noise, about 40 to 50%. The most disturbing part is that every time my eight month old baby lets out a cry, the gong goes off or the light goes on. As far as being a useful working home control system, I think there's a ways to go yet."

Pittman said he felt he might have sounded "pretty negative" about Waldo, "but I'm not really. Just a little unsatisfied with the performance. I have not approached Artra with my difficulties so I don't imply they haven't given product support. Artra is a pioneer in this field for Zenith computers and will continue to develop and refine the product." Because Waldo's voice-recognition capability is still fallible, Launey does recommend that you should not use Waldo to control potentially dangerous electrical and mechanical appliances (fans, ovens, disposals, etc.)

When you are recording a signature, everything else in the room must be quiet, or the microphone will interpret extraneous sounds as the beginning of a phrase.

However, Artra's documentation addresses the problem of signature reliability candidly and intelligently; I found it very helpful. Indeed, Waldo's documentation in general is distinctly superior (as far as a layman can judge). There's an eight-page chapter on "Theory of Operation," the instructions for assembly are clearly written, and Launey has provided instructions on how to use the Housemaster software. However, one warning is in order: although the software is "user-friendly," getting the most out of Waldo does require

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some technical background. If you feel comfortable working with technical projects, though, I think you will find Waldo easy to use.

Behind the scenes at Artra

Artra originally sold Housemaster home control systems to owners of Digital Group computers, primarily because Launey happened to own one. Digital Group was one of the very early microcomputer manufacturers. It came into existence very soon after MITS announced its Altair kit, and, like MITS, it eventually disappeared into oblivion. I saw Launey's Digital Group machine, and it's immensely bulky—they built microcomputers *big* in those days. Launey says he ultimately sold a Housemaster to one out of every 25 Digital Group owners.

He hopes to sell the same proportion of home control systems to owners of Heath/Zenith computers. I used that information to do a little speculation about Artra's business situation. There are about 50,000 installed H/Z89s out there, so Artra's maximum possible Heath/Zenith market is probably no more than 2,000 units, and perhaps somewhat less. At $500 a unit, I calculate a potential gross of $1,000,000. That may seem like a lot of money, but that's *gross* income. You have to deduct quite a few costs—research and development, components, partial or complete assembly, overhead, etc.—and then spread that net income over, say, three to six years. That leaves you with an annual company income which can pay for a handful of employees. That's a very satisfying step to reach, most entre-

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preneurs will tell you; but they'll also tell you that very few ambitious people are willing to stop at the "cottage industry" stage.

The foregoing speculation may shed some light on Artra's plans to go beyond the Heath/Zenith market. Artra is now selling the Waldo circuit board to Apple II owners. The business implications are clear. With 750,000 Apple IIs out there, you're talking about real money if you can sell even one Waldo for every 100 Apple owners. And Artra need not stop with Apple; it appears to be possible to adapt Waldo to most microcomputer systems. Launey wants to establish Artra as *the* standard name in the developing market for home control systems.

To judge by the afternoon I spent at Artra, Launey stands a good chance of achieving that goal. He quit a job with a defense consulting firm two and a half years ago, and ever since he's been working full time for Artra. And, like most self-employed entrepreneurs, when he says "full time," he means it. He usually puts in 60 or 70 hours a week.

Launey's not content with Waldo's technology, nor with Artra's current product line. He seems to be thinking several years ahead. This year, for example, Artra is working on software which will enable Waldo to control an auto-dial modem, and thus have access to information in phone-up data bases. The indications are that voice synthesis and recognition technology will advance very rapidly in the next several years, and Artra seems poised to take advantage of that growth.

Let's return for a moment to Hillary Launey, the young lady we met at the beginning of this piece. Hillary is going to be one of the very first children to grow up in a microcomputer-controlled home. As soon as her voice stabilizes a bit—perhaps by the time you read this—she will be able to record voice signatures and give Waldo commands. When she wakes up in a dark room, Hillary will be able to say, "Volvo, turn on the light."

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The 1983 Buss Directory

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Circle #101 on Reader Service Card

Letting Lindley Systems Drive Your Epson Printer

A review of an HDOS device driver.

Joseph González

After doing some deep soul (and pocket) searching, I decided that the Epson MX–80F/T was the dot-matrix printer that met all my requirements. It offered attractive print, optional print size, the ability to handle single sheets, and was within my budget. However, it is not my purpose to review the merits of the Epson, but to tell you my experience in interfacing it to my Heath computer. In particular, I'd like to tell you about the software I use to run it.

If you are like me, you subscribe to different computer publications. In the Heath/Zenith-specific ones (*REMark*, *Buss*, etc.), several letters and articles have appeared in the past advocating different schemes to connect the Epson to a Heath computer. Each one seems to be different from or in contradiction to all the others. Novices like me wonder if it is worth it to venture buying the Epson in the face of all this confusion. That is when I discovered that you can feel very lonely when you buy a peripheral for your system that is not made by the manufacturer of your other equipment. You wonder if you can hook it up properly. Will the software you have make it tick?

Talking to the Epson

The Epson can communicate with the Heath by one of two protocols. It comes standard with a parallel interface, or as an option you can buy a serial interface board to put inside the printer. This last one will allow it to be used with a system using the RS–232C protocol for serial communications. Since I had a four-port serial interface board inside my computer, I decided to go this route. Although the RS–232C signals are standardized, one of the things I soon discovered was that different manufacturers use them in different ways. I also found out that the printer does not include a cable to connect to the computer. I would have to buy or build my own.

Before buying the printer, I wrote to Epson America, Inc., the U.S. distributor, to find out how to interface it to my computer. Epson offers three different serial boards to go into the printer. They answered by sending me a list of their boards. One of them was circled as being the one compatible with the Heath. There was no mention as to what cable (male to male, female to male, etc.) was needed or what signal was to go to what pin.

Heath technical services answered one of my letters by sending me a technical support bulletin. It said what wire to connect to what pin, but it did not mention what Epson interface board to use. The bulletin stated that software written for the WH24 and WH14 printers would work with the Epson printer. But there was also a somber note in the response: "The SET LP: HELP functions will not work."

You can feel very lonely when you buy a peripheral for your system that is not made by the manufacturer of your other equipment.

This final note almost made me buy the H14 printer.

Just before I gave up my hopes of ever buying the Epson, I saw an announcement in *Buss: The Independent Newsletter of Heath Co. Computers*. It was for custom printer device drivers, the software tools used to control peripherals. Among several listed was a driver for Epson's MX–80. The announcement stated that with the driver, instructions on how to hook up the printer were included. I suddenly remembered someone's words of wisdom: First find the software you want and then buy the hardware to run it.

The announcement in *Buss* mentioned something I never thought of before. It claimed that I could control the printer by inserting control characters in an ordinary ASCII text file.

To make a peripheral perform one of the tricks it is capable of, you must first send it an appropriate code, a particular escape code. This is how, for example, you select inverse video or graphics in the H19 terminal. Up to that point, I always thought that the only way to send an escape code to a peripheral was through a computer program. It never occurred to me that codes could be inserted inside plain text. So I had assumed that to make the Epson change font size I would first have to go to BASIC, send the code with a program, then copy my edited text to the printer. Live and learn.

What am I doing? Adding to the confusion? No, *señor*. I am about to introduce you to a hook-up that works! The system is based on the Epson device driver by Lindley Systems of Bedford, Massachusetts. I can only review this device driver running under the Heath Disk Operating System (HDOS), but Lindley Systems offers a modification to run under CP/M.

My system consists of an H8 computer, H8–4 serial card, H19 terminal, H17 disk drive, and an Epson MX–

```
                                                        Preset to:
TAB/NOTAB   Tabs processed by driver or printer           TAB
FF/NOFF     Form feed on close                            NOFF
PORT   N    Port address (octal value)                    340
MASK   N    Selects printer busy bits                     **
READY  N    Bit values for printer ready                  **
BAUD   N    Printer baud rate                             9600
LEFT   N    Inserts spaces at left margin                 0
PAGE   N    Line number where driver adds a form feed     0
FORM   N    Form length set by driver                     0
HELP        Show options and their current settings
    ** Value depends on interface option selected.
```

Table 1: SET options available for the Lindley Systems device driver.

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80F/T (either friction or tractor feed). But do not stop reading because you have an H/Z89 and a parallel card. Good old Lindley Systems has provided for practically all of us.

What does Lindley give you?

These are only a few of the commands possible from your text (and they can also be sent from your terminal keyboard):
Turn on the expanded character mode;
Tell the printer to ignore the end of paper signal (F/T users love this one);
Underline or overstrike text;
Add spaces to left margin;
Turn on the graphics mode;
Change line spacing; and
Control–P.

What is this Control–P? If you have ever had the opportunity to use CP/M, you know that one of its features is the ability to echo to your printer all output sent to your terminal. Until now, this was only possible under HDOS by some form of hardware wizardry or by using a program that would put your terminal in parallel to an alternate terminal. The Lindley Systems device driver will perform the magic for you. It will also prevent the printer from receiving escape codes intended for the terminal but which could confuse the printer (e.g., erase screen, save cursor position, etc.). To turn on the echo function just type Control–P and the echo is on. You want it off, just hit Control–P again. The echo function will even carry over to your programs. If you type Control–P and then go to Microsoft BASIC, the echo will continue. You get a hard copy duplicate of whatever shows up on the screen even though your program wasn't designed to provide printouts.

The Lindley Systems device driver also includes an extensive list of options that you can change using the HDOS SET utility. Table 1 shows you the options available. One advantage is that typing SET LP: HELP gives you all the values of the options as presently selected.

How does it work?

This is how the device driver works. Lindley Systems has selected the tilde (~) as a control character. If you write a tilde followed by a particular combination of characters, you will cause the Epson to perform one of its tricks. For example: if you own an MX–80F/T and you want to print to the bottom of a single sheet, you must first disable the end of paper signal. To do this, insert a code into your text before the signal is activated. The code is ~[8 (tilde left bracket 8). The device driver reads the tilde, assumes you want to send an escape code, then reads the escape code. (In this example, the bracket is interpreted as the escape character; and the 8, the code.) If you check your Epson manual, you'll see that escape 8 is used to disable the out of paper signal. The control codes obviously will not be printed, but will be acted upon. (If you wish to print a tilde you must write two in a row; the second cancels the effect of the first.)

If you own the Graftrax option, by the way, there is an expanded set of codes that will let you choose italics, Radio Shack mode (on or off), etc.

The Epson includes several international character sets in its standard options. I was rather surprised that the Spanish character set was not included. The Lindley Systems device driver has helped me to simulate some of the Spanish characters. For example, at the beginning of this review I used the Spanish word for sir, *señor*. The English language does not have the equivalent of the *n* topped by the tilde. To reproduce the *ñ*, I write the word *senor*, then at the end of the line I write the code for carriage return with no line feed (~M~@). Then I overstrike the *n* with the tilde. This is how "Good afternoon, sir." would look on my screen:

```
Buenas tardes senor.~M~@
                    ~~
```

And this is how it comes out on my printer:

```
Buenas tardes señor.
```

The same technique is used to do accents (*González* is accented on top of the *a*). Unfortunately I can't reproduce

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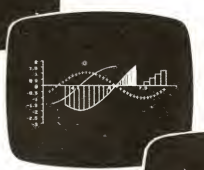

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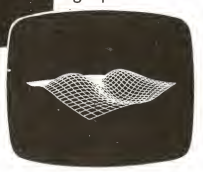

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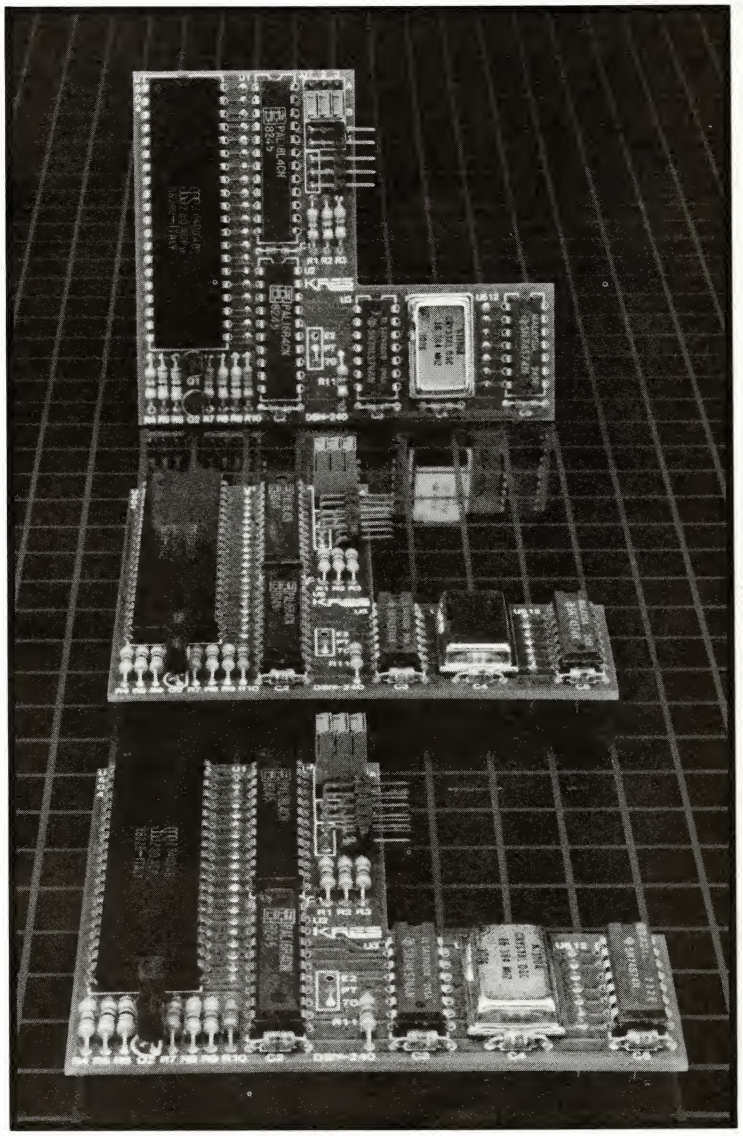

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the inverted ? and !, or the *diaeresis* (similar to the *umlaut* in German). And this technique will not work if the characters are in upper case since it would put the accent mark in the middle of the letter. If you can do without these, though, the technique is quite effective.

Assorted goodies

One of my original complaints regarding the Lindley Systems device driver was the choosing of the tilde as the control character. It made the tilde awkward to print. At the time, I was using an older version of the device driver. So I sent a letter to Lindley Systems. A short time later, I received a letter from Mr. Lindley Systems himself (Robert). He offered to send me a modified device driver with any character I chose as the new control character. There was an update fee of $10.00. I sent the money and received version 4.2 (the current one, and the first one with the echo feature). The control character I presently use is the vertical bar (|). I really don't use it that much.

To my surprise, the new version had all kinds of extra goodies. Included were the source codes for the various options, XTEXTs to aid in the assembly of the source codes, and even instructions on how to build a simple parallel board. Table 2 lists all the files included in the distribution disk.

The documentation is straightforward and includes examples of the commands and how they are used. It tells you how to modify the source code for special needs, and how to hook it all up. (More in a moment.) You might want to change the control character to another, as I did. The documentation tells you what to modify in the source code to achieve this. Mr. Lindley in his letter provided me with the address in the device driver where the control charac-

MXV42.DOC	General documentation for the entire driver
MX8250.DVD	Device driver for most H/Z89 and H8 uses
MX8250.DOC	Instructions for above driver
MX8251.DVD	Device driver H8-5 I/O card
MX8251.DOC	Instructions for above driver
MX8255.DVD	Device driver for 8255 parallel port use
MX8255HH.DOC	Instructions for above, H&H Board
MX8255TD.DOC	Instructions for above, Tru-Data Board
MXPERCOM.DVD	Device driver for the PERCOM Z controller parallel port
MXPERCOM.DOC	Instructions for above driver
MXDIRECT.DVD	Device driver for the FBE or do-it-yourself parallel port
MXDIRECT.DOC	Instructions for above driver
MXV42.ASM	Source code
MXHDR.ACM	Source header ACM file
MXSET.ACM	Source set options ACM file
MXDEVIO.ACM	Source device I/O ACM file
MXDATA.ACM	Source data space ACM file
MXSETP.ACM	Source load driver code, CTRL-P intercept
SWITCHES.MX	MX Printer switch settings
CODES.MX	MX Printer codes using the above drivers
PIO.SCH	Instructions for do-it-yourself parallel interface
TP.ABS	Computer typewriter program
TP.ASM	Source for the above
SUBSUPER	One way to do subscripts and superscripts
PROLOGUE.SYS	Automatic loading of driver after boot
README.DOC	This file

Table 2: Files included in the Lindley Systems distribution disk.

LP0:	Initialization sequence is nulled out -- continues action with current printer setup.
LP1:	5 characters per inch enlarged print.
LP2:	8.25 characters per inch condensed-enlarged print.
LP3:	10 characters per inch emphasized print.
LP4:	16.5 characters per inch condensed print.

Table 3: Device names for the Lindley Systems device driver. Each LPn: has a 16-character initialization sequence that can be reprogrammed to any desired sequence by the user.

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ter is defined. So now I can use Heath's PATCH utility to change the control character, rather than having to reassemble the source code. (The address is 5260. If you are using the HDOS PATCH utility, remember that the new character value must be in octal ASCII value—in my case, the tilde value of 176 was changed to the vertical bar value of 174.)

I said before that you could send commands to the Epson via the keyboard. This is done with a simple little program thrown in with the rest of the goodies in the distribution disk. The program is called TP. It is a line-by-line typewriter program for the printer. I bet you always wanted to use your system as a regular typewriter for simple things that didn't warrant the time, and effort, of loading editors and all that stuff. With TP, you type at your terminal and every time you hit the carriage return, the line typed is sent to the printer. It's that simple. You can also use TP to send commands to the printer before you send text to it.

You can send your material through any of five devices. These are LP: through LP4:, all using the same I/O port. Table 3 describes the setting of each device. To do listings and rough copy, I use LP: to save time and reduce printer wear. My good stuff is sent through LP3:; this is the emphasized font of the Epson. In the documentation, Lindley Systems tells you how to change the source code so that you can set up the printer for special needs. An example of this would be the use of special forms that might require a particular combination of line spacing and print size. I find the preset fonts cover all my needs.

And some closing comments

But how, in view of all the schemes suggested in the past, should the printer be "dipped" and wired to make it work? You guessed: it all depends! Lindley Systems has provided for five different situations in the documentation. Everyone should be pretty much covered by one of these. In Table 2, you should be able to find your particular set-up. I use the device driver written for the H8–4 card (MX8250.DVD). In the documentation, it says that I can do a straight-through wiring of the cable for the RS–232 port. But it also tells me the lines I can change in order to maintain compatibility with other Heath products (including CP/M). This is the route I took. This way, I can use the LPH24.DVD supplied with HDOS. By the way, you should SET the length option of the Heath device driver to 13. (This appeared in issue 19 of *REMark* magazine, August 1981.)

Why use the HDOS device driver? If you want your printer to list a program and it contains one of the Lindley Systems codes, you may end up with some garbage. The tilde is one of the characters used to produce graphics in the H19 terminal. If during the listing, the printer receives the tilde followed by a particular combination of characters, the Epson may have its graphics turned on. From that point on, you wind up with printed material that would only be fit for a Klingon restroom wall. So I find it convenient to keep the HDOS device driver at hand.

This brings to mind one annoying thing about the device driver. Before you use your printer, you *must* load the device driver into memory using the command LOAD LP:. Failure to do so will most likely result in the system hanging up on you. Lindley Systems includes in the distribution disk a file by the name of PROLOGUE.SYS. Copying this file to your working disk will cause an automatic loading of the device driver after booting the system.

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Avoid Unnecessary FORTRAN Input

PARSE is designed as a short cut to avoid typing in repetitious device and file-name specification.

Ralston W. Barnard

It often occurs that a program may use a number of files which must be specified at run-time. It can become quite tedious to have to type each of these filespecs, where the differences among them may only be the extensions (e.g., FILE1.INP, FILE1.OUP, and FILE1.DAT), or the device (e.g., DK0:filespec.INP, DK1:filespec.OUP). Conversely, coding the filespecs into the program to avoid all this typing may limit its usefulness.

To overcome this, I have written PARSE, a FORTRAN routine for the H11/LSI–11 which will allow entering only the necessary information. Default device names and extensions will be supplied, if they are not given. Furthermore, once the "root" filespec has been established, any number of additional filespecs can be defined without additional data entry.

For example, assume that a program uses an input file and a control file, and generates an output file. Each will reside on the same device and have the same file name, and will differ only in extension name. The usual dialogue is:

INPUT FILE NAME? DEV:FILE1.INP
CONTROL FILE NAME? DEV:FILE1.CON
OUTPUT FILE NAME? DEV:FILE1.RES

Using PARSE, only "FILE1" need be entered, if the extensions "INP", "CON", and "RES" have been specified as defaults in the code. If the input filename were "DEV:FILE2.IN3" instead, "FILE2.IN3" would be entered, and "DEV:FILE2.IN3", "DEV:FILE2.CON", and "DEV:FILE2.RES" would be built. Additionally, if the file were located on a different device from the default, specifying "DX1:FILE3" would result in all three files residing on DX1.

Because all components of the filespec are specified individually, any combination of devices and extensions can be individually specified. Device names and extensions may have one, two, or three characters (including numbers), and file names up to six characters.

```
      BYTE READNM(14), INPNAM(15), CONNAM(15), RESNAM(15), DEV(4),
     1EX1(4), EX2(4), EXT(4)
C
C     BYTE DIMENSIONS ALLOW MANIPULATION OF INDIVIDUAL CHARACTERS.
C     READNM IS THE DUMMY INPUT AND IS THE MAX LENGTH OF A LEGAL
C     RT-11 FILESPEC.
      .
      .
      .
      DATA DEV /'D','E','V',':'/      !":" MUST BE INCLUDED IN NAME
      DATA EX1 /'.','I','N','P'/      !"." MUST BE INCLUDED IN NAME
      DATA EX2 /'.','C','O','N'/
      .
      .
      .
      LASCHR= 0                 !MUST BE 0 FOR INITIAL PARSE
      ACCEPT 100, READNM
100   FORMAT (14A1)
C     BUILDS INITIAL FILESPEC
      CALL PARSE (READNM, INPNAM, DEV, EX1, LASCHR)
      OPEN (UNIT=1, NAME= INPNAM)
C     BUILDS ANOTHER FILESPEC WHICH DIFFERS ONLY BY EXTENSION
      CALL PARSE (INPNAM, CONNAM, DEV, EX2, LASCHR)
      OPEN (UNIT=2, NAME= CONNAM)
      .
      .
      .
C     TO CHANGE EXTENSION AT RUNTIME, USE THIS CODE
      ACCEPT 100, (EXT(K),K=2,4)
      EXT(1)= '.'          !NECESSARY FOR PROPER EXT FORMAT
      CALL PARSE (INPNAM, RESNAM, DEV, EXT, LASCHR)
      OPEN (UNIT=3, NAME= RESNAM)
      .
      .
      .
```

Listing 1: A sample of what you put in your program in order to use PARSE with a pre-specified device.

```
      .
      .
      .
      LASCHR= 0
      ACCEPT 100, READNM        !DON'T SPECIFY DEVICE HERE!
      CALL PARSE (READNM, INPNAM, DEV1, EXT1, LASCHR)
      .
      .
      .
      LASCHR= 0
      CALL PARSE (READNM, INPNAM, DEV2, EXT2, LASCHR)
      .
      .
      .
```

Listing 2: Specifying a different device for output would be done with this code.

Description of the code

The code has been written in standard DEC FORTRAN–IV, and no specialized SYSLIB string-handling routines (e.g., INDEX, SUBSTR, etc.) or data types (RAD50) have been used. Thus, the code should run on any version of the RT–11 and HT–11 operating systems without modification. It should also be quite straightforward to convert to FORTRAN under the Heath Disk Operating System (HDOS) running on an H8 or H/Z89. The BYTE data type may be used under HDOS FORTRAN, and the OPEN statement may be easily adapted to the requirements of that operating system. PARSE increases the size of .SAV files by about 470 words. Listing 3 gives the commented code, and Figure 1 shows the flow diagram.

The code relies on the colon to identify the device name, and a period to

indicate the presence of an extension. Thus, an input of "FILE" will give an output of "DEV:FILE.EXT" (where DEV and EXT are the defaults), while "FILE." will generate an output of "DEV:FILE." (with no extension). After the initial parse, the code saves the number of characters in the string comprising the device and file name only. Subsequent calls to PARSE can use the previously determined output file name as input, if only the extensions need be changed. The variables which hold the filespecs are arrays of characters. For a filespec consisting of a 3-character device name, a 6-character file name and a 3-character extension, the array must be dimensioned of size 14 (allowing for the colon and period). Output arrays should be dimensioned one greater than the input to accomodate the null byte (required for DEC systems); this is inserted by PARSE.

Coding Examples

In Listing 1, I give a sample of what you would put in your program in order to use PARSE with a pre-specified device. Specifying the device at run-time could be done in analogous manner, remembering that the fourth character of DEV must be a colon.

If two totally different file names are to be specified, LASCHR must be reset to zero before any call to PARSE in which a new file name input is to be used. Similarly, specifying a different device for output would be done with the code in Listing 2.

In summary, this routine allows flexibility in the manipulation of filespecs without the burden of a great deal of manual input.

Ordering Information

The program discussed in this article is available from CompuServe Information Service's Public Access area under the name PARSE.FOR (user ID 70260,265). A version of the program especially for DEC computers is available in CompuServe's MNET-11 Special Interest Group data base for H11/LSI-11 computer users under the same name and user ID. The DEC version of the program includes DEC-specific features to improve efficiency and ease of set-up for programmers.

```
      SUBROUTINE PARSE (INPNAM,OUPNAM,DEV,EXT,LAST)
C
C     R. W. BARNARD
C     BIO/COMP APPLICATIONS, ALBUQUERQUE, NM
C     VERSION OF 20-JAN-82
      BYTE INPNAM(1), OUPNAM(1), DEV(1), EXT(1), IEXT
      DATA NUL /"0/
      IF (LAST.GT.0) GO TO 150        !AUXILLARY FILE
      IEXT=.FALSE.
      DO 10 K=2,4          !CHECK FOR DEVICE
      KOLON=K              !USE : TO INDICATE DEVICE GIVEN
      IF (INPNAM(K).EQ.':') GO TO 30  !DEV: GIVEN
10    CONTINUE
      DO 20 K=1,4          !NO
20    OUPNAM(K)=DEV(K)     !USE DEFAULT DEVICE SPEC
      KOLON= 0             !POSITION IN INPNAM FOR DEFAULT
      LAST= 4              !POSITION IN OUPNAM FOR DEFAULT
      GO TO 50
30    DO 40 K=1,KOLON            !YES - DEV GIVEN
40    OUPNAM(K)= INPNAM(K)       !COPY
      LAST= 0
50    KS= KOLON+1    !NEXT POS IN INPNAM
      KE= KOLON+7    !6-CHAR MAX FILENAME
      DO 60 K= KS,KE
      KPOINT= K-1    !POS OF LAST ALPHA CHAR IN INPNAM
      IF (INPNAM(K).EQ.'.') IEXT=.TRUE.      !EXT GIVEN
      IF (INPNAM(K).EQ.' '.OR.IEXT) GO TO 70      !FILE NAME <6 CHAR + NO EXT
60    CONTINUE
70    DO 80 K= KS,KPOINT  !USE ACTUAL CHAR COUNT FROM INPNAM
      K1= LAST+K          !LOCATION IN OUPNAM (OFFSET IN INPNAM
80    OUPNAM(K1)= INPNAM(K)      !FOR DEFAULT FILENAME
      LAST= LAST+KPOINT   !TOTAL LENGTH OF OUPNAM W/O EXT
      IF (IEXT) GO TO 110 !EXT GIVEN
90    DO 100 K= 1,4       !NO EXT - USE DEFAULT
      K1= LAST+K          !OFFSET FOR OUPNAM
100   OUPNAM(K1)= EXT(K)
      GO TO 130
110   OUPNAM(LAST+1)= INPNAM(KPOINT+1)       !COPIES "."
      DO 120 K= 2,4 !YES - COPY EXT
      K1= LAST+K    !OFFSET FOR OUPNAM
      K2= KPOINT+K  !OFFSET FOR INPNAM
      IEXT= (INPNAM(K2).LT.'A'.OR.INPNAM(K2).GT.'Z') !LAST CHAR OF EXT
      .AND. (INPNAM(K2).LT.'0'.OR.INPNAM(K2).GT.'9') !(OR NUMBER)!
      IF (IEXT) GO TO 140 !SKIP IF NO ALPHA OR NUM (IE, END)
120   OUPNAM(K1)= INPNAM(K2)    !COPY
130   K1= K1+1      !LOCATION OF NEXT CHAR
140   OUPNAM(K1)= NUL     !NULL BYTE TO CLOSE
      RETURN
150   DO 160 K= 1,LAST    !COPIES OVER AUX FILE
160   OUPNAM(K)= INPNAM(K)       !(DEV AND FILENAME)
      GO TO 90   !GO COPY EXTENSION
      END
```

Listing 3: PARSE lets you avoid repetitious device and file-name specification.

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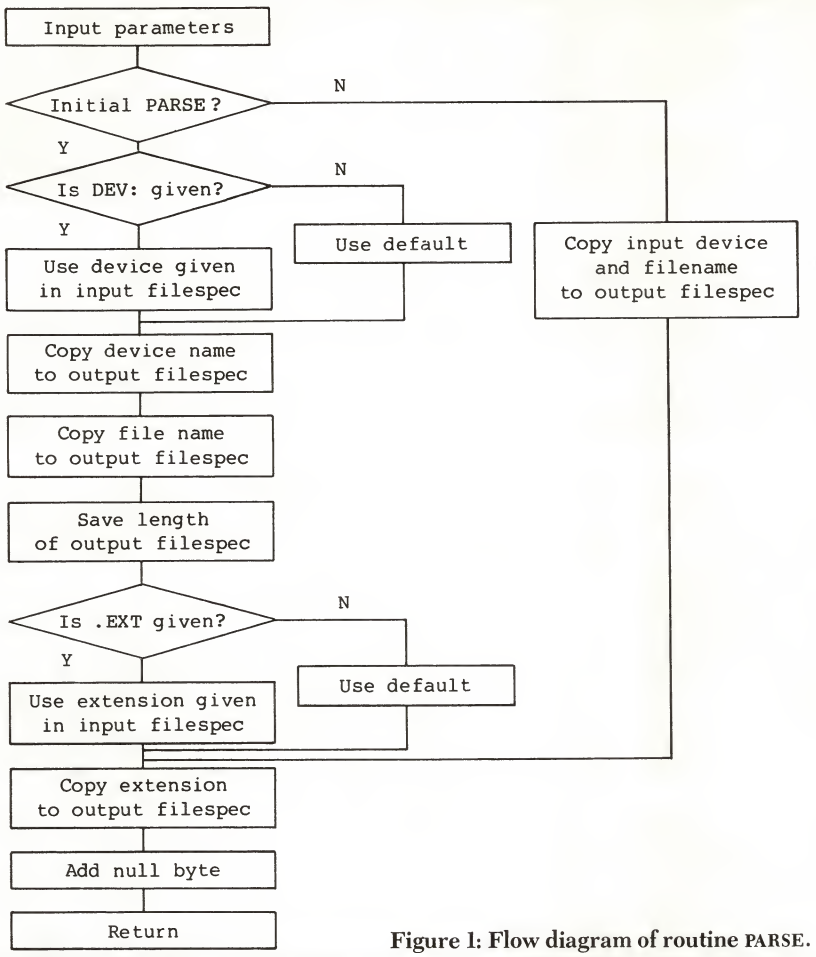

Figure 1: Flow diagram of routine PARSE.

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Photo by Philip Weinberg

The Civic Auditorium was the place for most independent suppliers to the Heath/Zenith community to show their wares to Faire-goers.

Photo by Philip Weinberg

It pays to have satisfied customers. With Brian Whisnant at the keyboard demonstrating software, Janet Hoyle of Hoyle & Hoyle had more time to devote to the business end of things.

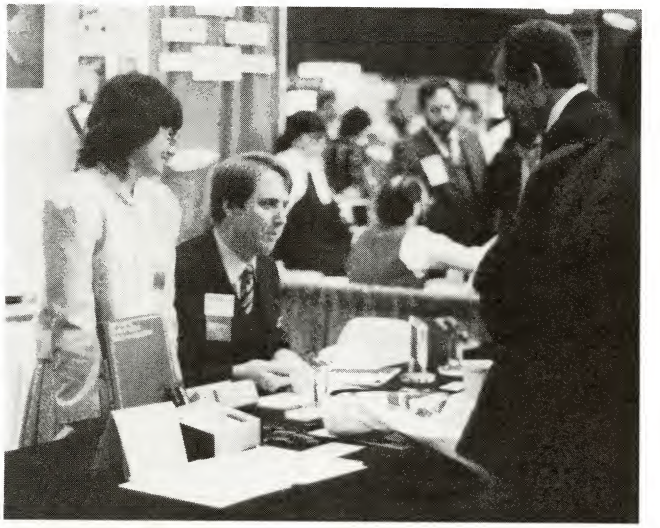

Photo by Elizabeth Saxon

Some companies emphasized software. One of them was, unsurprisingly, The Software Toolworks (in the background). Kres Engineering (in the foreground) was one of those emphasizing hardware: their expansion board and their dual-speed modules for faster CPU operation.

Photo by Elizabeth Saxon

The *Buss/Sextant* booth was a stop-off point for writers and would-be writers in the Heath/Zenith field. They had a chance to compare notes, exchange ideas, and discuss possible articles among themselves and with the *Sextant* staff. Among others, Hal Glatzer (right), author of *How to Use: Zenith/Heath Computers* was on hand to discuss his book. Al Dallas (center), was there to cover the Faire as contributing editor to *Buss*.

Photo by Philip Weinberg

The Faire has always prided itself on having space available for small and start-up companies. To make room this year, they had to open up an area normally used just for storage. Companies like American Bell didn't seem to mind the somewhat rough-and-ready atmosphere: it was their chance to move into the big time.

At the Faire: The Heath/Zenith Community

Those who attended got a glimpse of the future.

Frederick Zimmerman

Do you remember the huge warehouse at the end of "Raiders of the Lost Ark"? Picture it filled with thousands of microcomputers. Then imagine thousands and thousands of curious human beings swarming around inside that immense enclosed space.

That's more or less what you'd have seen if you'd stood at the entrance to subterranean Brooks Hall in San Francisco, March 18-20, and looked down into the Eighth West Coast Computer Faire.

Yet the scene in Brooks Hall was just part of the spectacle which drew 47,000 microcomputer enthusiasts and browsers to the Faire. There was another entire building full of exhibits in the Civic Auditorium (adjacent, above ground). The Auditorium included areas for IBM, Apple, Osborne, Texas Instruments, and Heath/Zenith, among others. There were dozens of "micro-booths" filled with small suppliers, users' groups, and public policy associations. Their modest set-ups sometimes made a striking contrast to the glittery corporate professionalism on display in the main exhibit areas. Such contrasts, indeed, are part of the Faire's greatest attraction: the stimulating atmosphere of a bazaar.

The West Coast Computer Faire has other attractions, of course, for both buyer and seller. It has tradition: the Faire is one of the oldest of the user-oriented microcomputer conferences. It is also a prime location for sellers to show off their wares, to reassure the general public that the company is in sound financial shape, and to court new customers.

The customers provide both direct and indirect sources of revenue. Direct revenue comes from the walk-in buyers, most of whom are from the local northern California area. Indirect revenues come from making contacts with distributors, advertisers, dealers, and fellow sellers.

Both buyers and sellers can learn about new developments in the industry. New products are often displayed for the first time at the Faire. The Faire also organizes scores of educational seminars. These are held in upstairs classrooms at the Civic Auditorium or in various nearby hotels. And the West Coast Computer Faire has one final, clinching attraction: it's held in San Francisco at the beginning of spring. . . .

Ample reason, then, for *Sextant* and its sister publication, *Buss: The Independent Newsletter of Heath Co. Computers,* to attend the Faire.

For Heath/Zenith users

There was more to see in the Heath/Zenith area this year than ever before. At least fifteen companies were showing products intended specifically for Heath/Zenith users. Most of those companies were located within a forty-foot radius of the Heath booth, so it was feasible — and convenient — to see almost everything.

The Heath Company and Zenith Data Systems had a 10′ x 40′ booth. They were demonstrating the H/Z100 dual-processor computer and the Heath Educational RObot (HERO). They also showed some interesting new products: the ZF207 8″ disk drives for the H/Z100; the Winchester hard disk system for the H/Z100; and the Z29 terminal, with its detachable keyboard.

The Heathkit booth was divided into sections showcasing different branches of the company: terminals and monitors, educational products (the division which is responsible for HERO), and the computer product division.

The accountant told C.D.R., "Hey! You've got to sell these, nobody else has them."

Heath seemed to have done good business at the Faire. My unscientific estimate is that there were ten to twenty visitors in the booth at any typical moment. Perhaps most important, though, the Heath booth projected a good image to the outside world.

The Heath/Zenith independent suppliers looked good at the Faire, too. Near the Heath booth were: C.D.R. Systems; Commsoft; Evryware; Hoyle & Hoyle Software; Kres Engineering; Magnolia Microsystems; MicroMaster; Micro Peripherals, Inc. (M.P.I.); Microtran; Sextant Publishing Company; The Software Toolworks; Studio Computers; Technical Micro Systems, Inc. (TMSI); and Trionyx Electronics, Inc.

Talking to the independent vendors

On Thursday, while they were setting up, few of the vendors professed to have high expectations. "I don't really expect to sell much," said Ray Massa of Studio Computers, located in Birmingham, Michigan. He and his family drove out to California for a vacation after the Faire. Massa admitted that he came to HUGCON 1 — the first-ever Heath users' conference, held in Chicago in August 1982 — with similarly low expectations, yet "actually did quite well."

Bill Perry of Trionyx told me, "I'm not expecting anything, but I'm prepared to do a lot of business should that eventuality occur." Perry ran into one unforeseen eventuality before he had even finished setting up. He brought in a large sheet of pegboard to serve as the back wall of his booth (so he could display printed circuit boards from it). Assembling the pegboard was about a half-an-hour job with simple tools. However, one of the Civic Auditorium's

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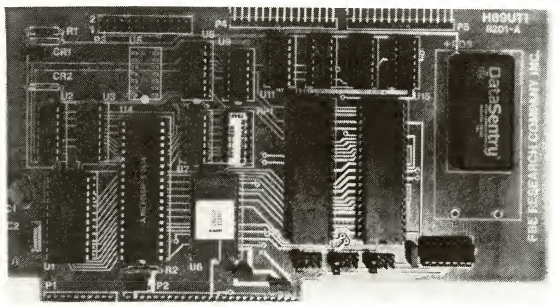

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union workmen came by and said, "Will you be using tools to do that?" Perry, perhaps somewhat unwisely, said "yes" —and the union man sprang the bad news on him: if you do any work with tools in the Civic Auditorium, you have to do it with a $34/hour union worker in your employ. Perry tried to argue his way out of it, but had no luck. He told me philosophically, "I guess that's just one of the costs of doing business."

Friday seemed to be the busiest day of the Faire, and by the end of the day most exhibitors were ready to drop. TMSI had two people there: Tom Snoblen and Chief Engineer Lee Hart. Hart told me: "Next year we'll have a minimum of three people to man the booth, maybe four."

TMSI was showing its new H/Z89 upgrade board, the H1000, for the first time. The specifications are impressive: Z80/8086 dual central processor units (CPUs), 128K minimum random-access memory (RAM), and claimed compatibility with IBM Personal Computer and H/Z100 software. Some people were surprised to see the actual H1000 boards—not, I hasten to add, because of any doubts about TMSI in particular, but rather because it is the regrettable practice in the microcomputing industry to announce products before their actual realization and availability. It's not always clear whether an announced product is actually feasible. That climate of generalized skepticism partially explains the reaction I heard from competitor Myron Seibold of Trionyx the first time he saw the H1000. "Oh no!" he exclaimed in mock horror, "that means it can be done!"

Quite a few of the other exhibitors' booths were understaffed, with only two or three people to answer hundreds of questions from persistent Heath users. Some exhibitors were fortunate enough, however, to have help staffing their booths. For example, Janet Hoyle was assisted by a satisfied customer, a San Jose college student named Brian Whisnant. On Thursday he helped her set up Hoyle & Hoyle's exhibit. On Friday, he helped out by demonstrating Hoyle & Hoyle's Adventure-style games on the H/Z89 in front of the booth. This gave Janet more time to talk with prospective customers, to make contacts with distributors, dealers, etc., and simply to enjoy the Faire.

Evryware, which sells arcade-style games for the '89, was sharing the booth with Hoyle & Hoyle. Some other exhibitors shared booths, too. Two Heath/Zenith dealers, Mr. and Mrs. Bob Chamberlain, shared with C.D.R.'s Marc Brooks. When I talked to Marc on Thursday, he explained that he wasn't at the Faire to sell. "I'm here to check up with our customers in the area, to tell them about software updates"—essentially, to touch base. The Chamberlains, on the other hand, were there to sell. I talked to them at the end of the Faire, and they were impressed by how many friendly people they had met. "The overall interest was really fantastic," Bob Chamberlain said.

I asked Marc how he got started selling products for the Heath/Zenith community. First, he gave me some background. C.D.R. also makes products called "data loggers," or "harsh environment measurement sensors." Let's say an oil company has a pipeline on the ocean floor, and they want to measure the stresses on each segment of pipe. The solution: a data logger. C.D.R. makes such products for several large corporations, which are willing to pay well. Marc said, "The data logger is our major business."

The business, however, comes in spurts. In one of its slow times several years ago, C.D.R. decided that its accountant needed a computer, and got him an '89. "It didn't have CP/M or an 8" controller at the time, so we whipped one up for him." The accountant told C.D.R., "Hey!

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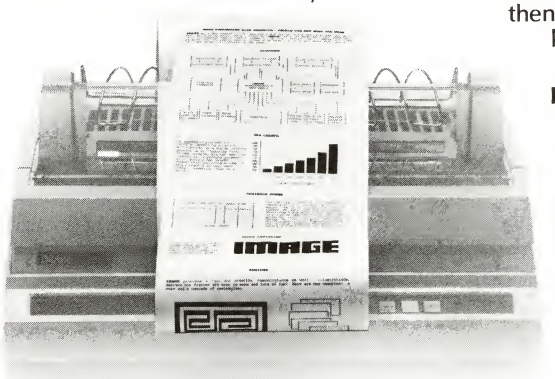

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You've got to sell these, nobody else has them." So C.D.R. entered the Heath/Zenith marketplace, and Marc says they're glad to have found a steady source of income to supplement the more cyclical data logger business.

MicroMaster of Syosset, New York, was in the booth to the right of C.D.R., showing hard disk systems for the H/Z89. Kres Engineering of Irvine, California, was in the booth on C.D.R.'s left side, showing the Kres Expansion board. The Kres board piggybacks onto an H/Z89 CPU card, providing seven input/output (I/O) slots. At the Kres booth I also saw my first microdisk, a 3″ Amdek. It's enclosed in a shell similar to that on a stereo cassette, so it's considerably more sturdy than a floppy. And it fits in a shirt pocket — which should make for a considerable improvement in user-friendliness and portability.

Around the corner were the folks from M.P.I., in for the Faire from Salt Lake City. I spotted a familiar face there: M.P.I.'s 99G printer. If you subscribe to *Buss*, your address label is probably printed on the 99G which we have in the *Buss/Sextant* computer room. The folks from M.P.I. had a 99G and its larger sibling, the PrintMate 150, hooked up to two Z100s. They were demonstrating the printers' ability to reproduce the screen display.

Magnolia Microsystems was located directly across from the *Buss/Sextant* booth. They were showing their new local area networking product, MMS-Net, with three '89s and a Z29 terminal linked up. The people at Magnolia, like several of the other exhibitors in the Heath/Zenith area, say they aren't thinking of themselves as solely a Heath/Zenith supplier. They hope to adapt MMS-Net to a variety of other microcomputers, which would enable them to reach a larger market.

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There was more to see in the Heath/Zenith area this year than ever before. At least fifteen companies were showing products intended specifically for Heath/Zenith users.

I saw several Heath/Zenith suppliers who were moving into other sectors of the microcomputer market. The Software Toolworks' booth was located in the Heath/Zenith area, but Walt Bilofsky was also selling KayPro and Osborne software. Commsoft, right next door to the Heath/Zenith area, was strongly emphasizing a video graphics system for the Apple, and you had to look hard to find the Heath/Zenith connection. For Heath/Zenith users, Commsoft was selling its genealogical program, ROOTS, and some ham radio software. Finally, Reuel Launey and Artra were all the way off in Apple Hall with the Waldo home control system (formerly known as Housemaster). Reuel stopped by the *Buss/Sextant* booth to say hello, and to reassure us that he's still selling Waldo for the H/Z89. Artra, like most of the companies moving beyond the Heath/Zenith market, seems eager to hold onto its satisfied Heath/Zenith customers. (For further information about Artra, see the article elsewhere in this issue.) Floppy Disk Services was also at the Faire, down in Brooks Hall. They told us that they'd done unusually good business at the

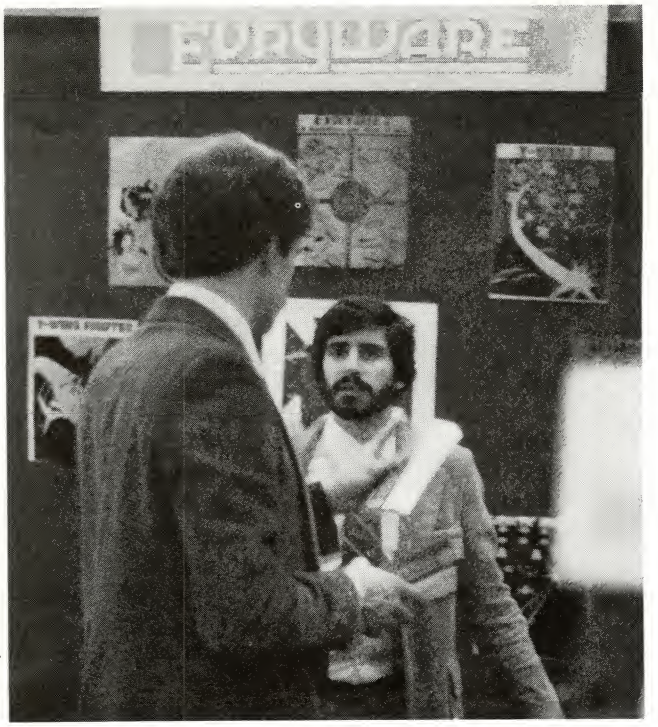

Photo by Elizabeth Saxon

Joe Gargiulo was just one of those from Evryware on hand to explain, sell, show, debate, and play their selection of arcade-style computer games. The latest of which was Barry Murry's "Wizards of Zeetle-Deet." Its script includes a depraved wizard, a beautiful princess, and you as the wizard who's supposed to bring the happy ending. You also cope with a supporting cast of trapped villagers, strange creatures, and a horde of demons of generally unsavory character.

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Photo by Elizabeth Saxon

If you were thinking of getting a printer for your Heath/Zenith computer, you might have stopped by the Micro Peripherals, Inc. (M.P.I.) display to see John Matlock (left). A lot of people did just that. Some who came needed answers right away — others had a bit more time to decide what their long-term requirements were.

Capital Heath Users' Group's regional conference last November, CHUGCON 82. To judge from the crowds around their booth in Brooks Hall, they did very well at the Faire.

Photo by Elizabeth Saxon

Rick Lutowski (left) of Microtran offers, among other things, software support for the 9511 math chip. Trionyx, with Bill Perry (right) in attendance, makes the math board for the H8, as well as a wide range of other H8 enhancements. Since the two companies shared space at the Faire, customers with questions about the continuing development of the H8 computer could get software answers or hardware answers in one location.

Visitors

Some well-known members of the Heath/Zenith community dropped by the exhibition area. Ray Livingston and Dean Gibson, of Livingston Logic Labs and UltiMeth, respectively, visited for a few minutes. Al Dallas, contributing editor of *Buss*, came back from Japan — where he was

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23 ~~18~~ **PROGRAMS FOR HEATH/ZENITH COMPUTERS**

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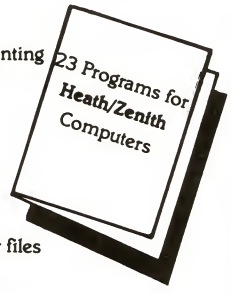

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Photo by Elizabeth Saxon

Magnolia Microsystems showcased its new networking product MMS-Net—as well as their CP/M products and add-on boards for the H/Z89. While talk toward the front of the booth ranged over these and more, Magnolia's president, Kay Gjerding, duly presided over everything from a calmer corner in back.

helping to build a Tokyo Disneyland—just in time to cover the Faire for *Sextant*'s sister publication. (See issue 66 of *Buss*.)

Hal Glatzer, author of *Zenith/Heath Computers*, came Saturday. Since we were selling his book in our booth, we had a chance to chat briefly about his background. He said he's been a professional journalist for more than a decade, including a few years in Hawaii. He still thinks of himself as a writer, not a software hacker: "I'm a journalist, and computers are my beat."

Jerry Pournelle, science-fiction author and *Byte* columnist, talked with us about the Z100 he's been using. He likes its hardware capabilities, but is unhappy with the amount of effort Zenith has devoted to developing software for the Z100. He concurred with us on a few justifiable (although minor) complaints about Z-DOS.

Why, when you boot Z-DOS, is the date perpetually stuck at 8-27-82? It's very annoying to have to type a new date every single time you turn the machine on. Surely it would be easy enough to simply change the default date to the last date entered. There's a similar problem with the time: Z-DOS always thinks it's 8:30 a.m. until you tell it otherwise. This is a nuisance when you do a CTRL-RESET and reboot.

Another Pournelle gripe: the Z-DOS manual doesn't tell you how to disable the "key click" feature. There's a tantalizing list of the proper escape sequences to control various keyboard and terminal functions—key click, foreground and background color, block versus underline cursor—but the manual gives no hint as to how to get Z-DOS to recognize those sequences. If you simply hit ESCAPE and the appropriate "suffixes," nothing happens.

(I've found a "kludgy" way to use escape sequences on the Z100. I used the "insert special character" feature of an editor to create a text file consisting of the appropriate escape codes. Then I went back to Z-DOS and TYPEd the file to the screen. Voila! Black letters on a red background, or whatever. There should be an easier way, though.)

Heath Users' Group meeting

HUG held a meeting at 11:00 a.m. Sunday, upstairs in the Civic Auditorium. Representing Heath/Zenith: Terry Jensen, software developer for the national group; Wayne

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Wilson of the product planning division; and Barry Watzman, computer product line manager for Heath/Zenith. For two hours, they fielded questions from their audience of slightly more than 150 Heath/Zenith computer users — and they provided informative, responsive answers.

Terry Jensen was the moderator. He started things off on a gracious note. Many of the independent hardware and software vendors were present, and Jensen took the time to introduce them to the audience. Then he stirred up a little audience participation, asking people to stand up and call out where they were from. People came from as far away as Portland-Vancouver, Oregon; Kansas City; Hawaii ("Nice swim?" asked Jensen); Washington, D.C.; Detroit; Seattle; and North Carolina. Of course, there were quite a few from California, too: Anaheim, San Jose, El Cerrito, San Diego, Sacramento, and Redwood City, among others. Next, Jensen answered a few questions.

"Is HDOS dead?" one pessimist asked him. "There's one of those incriminating questions," Terry admitted, "so I'll say, 'I don't know.'"

"Would it ever be possible to get *REMark* programs downloaded on MicroNet?" was the next question. Terry was definitely the right person to ask, since he's the system operator for the Heath Users' Group's computerized bulletin board on CompuServe's MicroNet. "Everything's possible," he said. However, "right now we're getting so many new members on board," that he's simply too swamped to undertake new projects. At latest count, there are 1,644 HUG members on MicroNet, with 25 or more joining each week. Since every new membership has to be verified and processed, just keeping up to date takes a lot of time.

(Incidentally, Terry mentioned that there are now over 17,000 members of the national HUG. "If you guys keep hollerin', Zenith might sometime listen," he said.)

He also announced that HUG has made a special public domain disk which it will distribute to all the local groups, and which they may then distribute as they want. Apparently HUG is in the early stages of restructuring its software program. "It's kind of tricky right now," Jensen said. ". . . I'm not sure just how it's going to turn out."

After a few minutes more of question and answer, Jensen turned the microphone over to Wayne Wilson — and HERO.

HERO's histrionics

Wilson claimed to be worried as he began his demonstration of HERO. "Bear with me," he said, "We may have an operator malfunction." Both robot and operator functioned very well, though. Wilson put HERO on a table next to the microphone and gave us a very smooth presentation of HERO's capabilities.

Wilson said that he was asked to do one of the very first "proof builds" of the robot kit. It took him a long time—80 hours—but that was a pre-production version. Heath says HERO should take 40 to 60 hours. "It was about as tough [to build] as an H9," Wilson said, referring to Heath's first computer terminal, "except that it worked when I turned it on."

Wilson avoided saying exactly how many HEROs Heath has sold, but he did say that Heath has sold out its first two production runs and has two to three months of back orders waiting. "There was a prediction in one of the business magazines saying there would be two to three thousand personal robots sold this year; I can tell you that was dramatically underestimated."

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When HERO made its exit, it got the biggest applause of the day.

Watzman on operating systems

Computer product line manager Watzman made a few announcements, then opened the floor to questions.

Many Heath users use Digital Research's CP/M family of operating systems. So several people wanted to know when Heath will make some of Digital Research's new products available.

CP/M Plus: "I cannot say definitively that we will or won't [provide it]. It all is a question of priorities. My personal feeling, to the extent that it matters, is that we should do 3.0 (CP/M Plus) on the Z100 as an upgrade to CP/M-85. I would hope that we might be able to do that in August, give or take a couple of months. I also, personally, am in-

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clined not to do it on the Z89, because 3.0 in a non-banked system requires substantially more memory than 2.2. There is a lot of software that does not run under Z89 CP/M 3.0, unless you use the Magnolia card. I believe it is quite probable that Magnolia will be offering CP/M Plus on the Z89. . . if someone does it for the '89, it would be very easy to modify it for the H8."

Concurrent CP/M: "We are not currently working on Concurrent CP/M or MP/M [the multiuser version]. I personally wish that we were, but the fact of the matter is, we aren't. We *are* working on some networking stuff." In response to a later question, he said: "I think there is a tremendous opportunity" for an independent vendor to do Concurrent CP/M and MP/M.

"If they continue selling, we'll continue building them."

Zenith's new Z100 computer uses the Zenith Disk Operating System (Z-DOS), a variant of the Microsoft Disk Operating System (MS-DOS). Hence there were a few questions about the status of MS-DOS 2.0. Watzman said, "MS-DOS 2.0 we will definitely do. There's no question about that. There has been some discussion internally that some of the resources to get CP/M-86 out and some of the resources to get MS-DOS 2.0 out are the same. Currently they're allocated to CP/M-86, and that may change. I kind of don't want to see that change; I'd like to see CP/M-86 out already. But we will definitely be doing MS-DOS 2.0. I'm tempted to back off on 'definitely,' but I believe we will see it this year for certain, possibly by the late second or early third quarter. There will be extreme pressure on us, with the IBM announcement, to get that out."

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Photo by Elizabeth Saxon

Computer Product Line Manager Barry Watzman (left) fielded questions about the past, present, and future, as well as the whys and wherefores, of Heath/Zenith computers. His audience frequently included independent suppliers like Ray Livingston (with exhibitor badge) of Livingston Logic Labs. Barry's comments were one of the few things that could compete for attention with his little grey associate (center) from the Educational Systems division.

Watzman added, "The other comment I want to make on that is that in our benchmarks MS-DOS 2.0 is 60% slower than MS-DOS 1.0." MS-DOS 2.0 has enhanced features such as "pipes" and "filters" which make it easier for you to direct information from one program to another. However, the consequence of the enhanced features is that there is more work for the computer to do, and so the enhanced version runs more slowly.

MS-DOS and CP/M are the two favorites in the competition to sell a "standard" microcomputer operating system. However, there are other contenders, such as Unix, the operating system developed at Bell Labs in the early Seventies. Watzman said, "At the present time we're not pursuing Unix and Xenix [Microsoft's version of Unix] very heavily. We attended a couple of conferences [about Unix], and the consensus seems to be that the microworld is not going in that direction with the current generation of 16-bit processors. . . . That's not to say that we're ignoring it [Unix], but in the next year we don't feel that's the direction the mainstream of the market will go."

Watzman on Heath/Zenith software

To be blunt, Watzman didn't have much news about Zenith software. He announced that Zenith expects to be shipping Microsoft's versions of the FORTRAN and COBOL programming languages for the Z100 before the

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end of the year. He also announced the May availability of version IV of the UCSD p-System after, in his words, "what seemed like an interminable delay." He expressed hope that new software will be available to take full advantage of the Z100's memory capability. "There are a lot of 16-bit 8088-based software products right now which are capable of using only 64K of data space, and that includes potentially all of Microsoft's products."

However, Watzman warned, "It's going to be up to Microsoft to upgrade those products." He tacitly acknowledged that he's not entirely satisfied with the progress on upgrading 16-bit software for the Z100. "Very frankly," he noted, Digital Research and Microsoft "are taking their direction from one company right now" — and everyone in the audience inferred that he meant IBM.

"When will there be a Heathkit satellite?" one man called out. "That's not my product line," Watzman shot back.

Watzman on Heath/Zenith hardware

Watzman talked about the status of several Heath/Zenith hardware products. No, he said, it is not true that the last Z89 has been sold already. Zenith is continuing to build and stock the Z90 model of the '89 series (64K, soft-sectored disks). Furthermore, as of mid-March Zenith was still actively making new production commitments to original equipment manufacturers (OEMs) interested in "tailoring" Z90s for a particular application. There is one legal problem with continued production of the '89. A "grandfather clause" which excludes the '89, and some other microcomputers, from more stringent radio frequency interference (RFI) regulations will expire in October. Watzman didn't seem too worried about that problem, though. The company has "already made a decision to put in place procedures" to ensure that future production of the '89/'90 series will comply with the tighter RFI requirements. "In the case of one model, that will definitely happen because there's a production commitment." For other models, it's a contingency.

But that will depend on production. And production depends on sales. So how are sales doing?

"Sales are falling off. There's no doubt about that, they are," he said. "We're inclined to think that by the end of the year we will have committed, and possibly built, the last of the 8-bit products, with the exception of special OEM orders." The future of the '89 is "a decision that y'all are going to make, and it's based on the sales of the '89 over the next three to six months, I would say. If they continue selling, we'll continue building them."

However, it seems clear that Zenith is primarily committed to the Z100 as its computer for the future. Watzman answered several Z100 questions. One man asked about a hardware upgrade for the Z100, in connection with Watzman's earlier statement that MS-DOS 2.0 slows things down by about 60%. "Has any thought been given to retrofitting [an 8087] numeric co-processor?" "Yes," Watzman said promptly, "a lot of thought has been given to that. I don't have an answer for you right now. But we have a strong desire to fit the 8087 to our machine, and there is work going on to accomplish that goal." He was unwilling to specify a date or price, but said, "I am hopeful that, at

some point before the end of this year, we will be able to make an announcement regarding that."

Watzman talked about some other accessory projects: enhancing the firmware of the H/Z25 (now H/Z125) printer, and providing a light pen for the Z100. "Some work is being done on the firmware" for the Z125, he said, "but the work is being done on an off-and-on basis, and it's currently off." In response to a question about the light pen, he said, "There is a little development going on, but probably not as much as you'd like." He noted that the Z-DOS 1.10 basic input/output system (BIOS) includes support for a light pen. However, he admitted, Zenith hasn't done any hardware work yet. In general, Watzman left the impression that Zenith has put most such minor accessory projects on hold for the moment. Zenith seems to be concentrating on getting major products out the door — such as the 8" drives, Winchester hard disks, and so on.

The audience wanted to know what sorts of major product Heath/Zenith has in mind for the future. "When will there be a Heathkit satellite?" one man called out. "That's not my product line," Watzman shot back. On a somewhat more serious note, Watzman was asked if Zenith has any plans to do a small hand-held computer like those manufactured by Hewlett-Packard and Epson. He said it's not very likely that Zenith will attempt such a product. The essential problem is that companies like HP and Epson have an advantage in the integrated circuit technology which is crucial to making a hand-held computer.

Zenith does have advantages of its own—for example, in CRT technology. That's especially important in making suitcase-sized portable computers like the Osborne and the KayPro. I've been coveting a portable computer for some time now, so I was excited to hear Watzman say, "We may very possibly do a portable computer."

More advertising for Heath/Zenith?

At the very end of Watzman's session, Walt Bilofsky of The Software Toolworks posed a rather sarcastic question: "In August, when we were in Chicago [at the first National Heath Users' Group Conference], we were told about Zenith's marketing plans and advertising plans. Can you speculate on when they might start that?"

"The company appears to outsiders as a single monolith," Watzman began, "but inside, different people have different opinions on what should be done and how things should be done, how resources should be allocated." He assured Bilofsky that he fully sympathized with Walt's concern. However, he said, "I don't know that you'll see a significant change in the level of Zenith advertising during this year."

He closed on a more optimistic note. "I will say that there will be a little more end-user advertising, as opposed to dealer recruitment advertising." He pointed out that Zenith will advertise this year in *Personal Computing*, *Business Week*, and *Inc.* Furthermore, he said, Zenith has a nationally distributed radio show which is apparently quite effective. This advertising campaign would seem to do a good job of reaching small business, a prime Zenith marketing target.

Of course, the Heath Company and Zenith Data Systems have just recently displayed their merits in one national forum for microcomputing: the Eighth West Coast Computer Faire. The Heath/Zenith exhibition area was an excellent advertisement for Heath/Zenith computers. Let's hope the progress continues at the Ninth West Coast Computer Faire in San Francisco, March 23-25, 1984.

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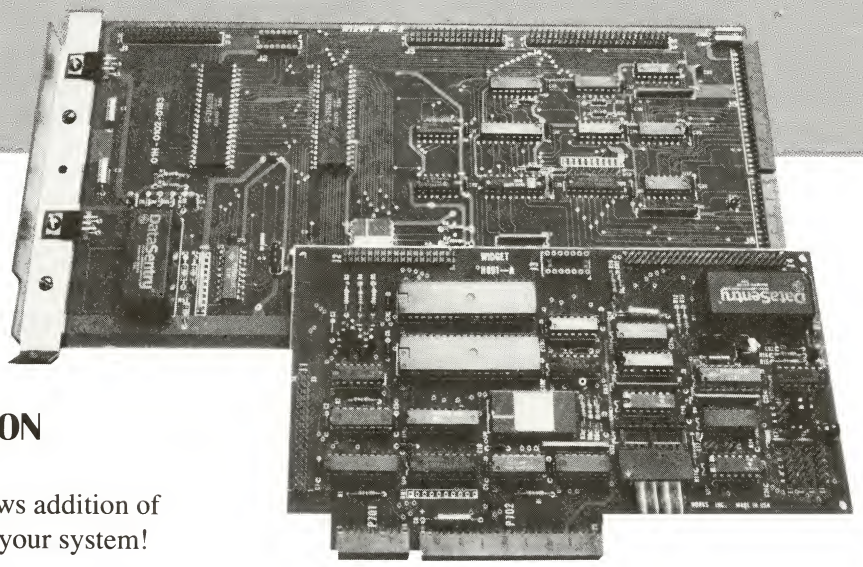

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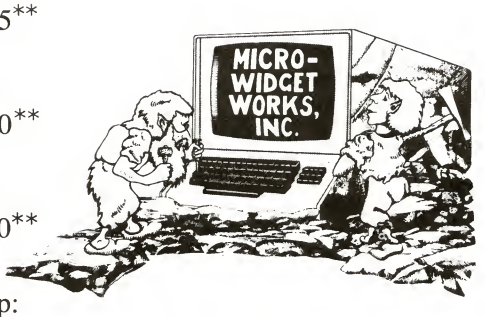

*AMD9511ADC/12ADC Advanced Math Processing Chip available for additional cost.
**Shipping and Handling charges extra. All California Residents must add 6% sales tax.
Charge Card and C.O.D. orders add 4% Surcharge. All prices are subject to change without notice.

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Circle #142 on Reader Service Card

Automatic Key-Repeat for Your '19 or '89

The R. P. Enterprises auto-repeat board gives your H/Z19 or H/Z89 keyboard the automatic key-repeat that many electric typewriters have.

Kirk L. Thompson

One of the minor shortcomings of the H/Z19 terminal, whether as a stand-alone or incorporated into the '89, is the absence of the automatic key-repeat found on most electric typewriters. The separate REPEAT key on the existing keyboard, while better than nothing, is inconvenient to use if your needs dictate a string of shifted, non-alphabetic characters. You have to be three-fingered for that!

A recent mailing by Henry Fale's Quikdata Computer Services included an ad by R. P. Enterprises for their auto-repeat board. Since the price was reasonable and I have found the above-mentioned arrangement somewhat aggravating, I ordered the board. It is shown in the photograph accompanying this article.

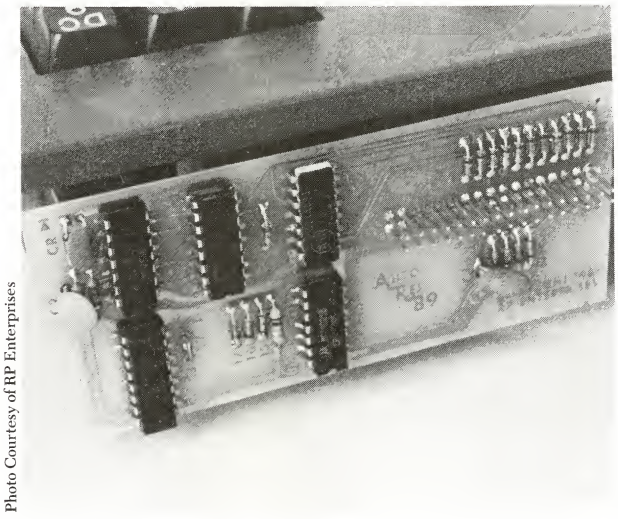

Photo Courtesy of RP Enterprises

The auto-repeat board plugs in directly behind the keypad on the keyboard unit. It is quite easy to install it rotated 180 degrees — preventing the keyboard unit from fitting back into the cabinet. Newer '89 cabinets have an internal lip that will block the keyboard unit if an older Auto-Rep-89 board is installed. Newer '89s also have ground straps that can get in the way. So R. P. Enterprises has reduced the size of the board from what is shown here.

As you can see, the board plugs directly into the rear of the keyboard. This makes installation very easy; and, since the board derives its power from the keyboard cable, it is also not necessary to run any other wires. The only thing you have to remember is to orient the flat cable with the red stripe toward the CRT before plugging it into the board.

After installation, R. P. Enterprises recommends a simple test before the keyboard assembly is refastened to the cabinet. This just entails setting the terminal off-line and pressing the SPACE bar and the keys on the "home" row to see that they do, indeed, repeat. I worked the entire keyboard, including shifting the keypad to ensure that the cursor control keys also repeated. That repetition occurs, by the way, at the same rate as when using the REPEAT key.

There is one user-selectable option on the auto-repeat board. This is the delay between the first character typed and the beginning of character repetition. It is selected by a jumper on the board and is factory-set for 0.5 seconds. If you should want a shorter delay (0.3 sec), it is a simple matter to cut the jumper and solder it into another hole on the board.

Only two minor quibbles

I have only two minor quibbles, neither of which have any effect on the operation of the installed board. The first is the packaging that it came in. R. P. Enterprises used a lightweight envelope with cardboard protecting the female connector side of the board, but only a simple chunk of styrofoam on the male side. As a consequence, the pins on the latter were rather bent up when the board arrived by mail. It took me a while to dig the crushed foam out from around the pins and then straighten about half of them. Because of that, I took extra care when installing the ribbon cable into the board. My second minor quibble is with the enclosed documentation. I think that a simple line-drawing would have helped to illustrate the orientation of the board during installation since it is quite easy to install it rotated 180 degrees if you aren't careful. (That is the principal reason for including the photo with this review!) Although the keyboard will not fit back into the cabinet if the R. P. board is not installed properly, it is a bear to remove after you have seated it.

Despite the minor problems above, I am very happy with the auto key-repeat board. It works as advertised and is made of good quality materials. It certainly makes editing with screen editors much, much easier. It's also a great help with the built-in editing functions included in most interpreters.

Ordering Information

Auto-Rep-89, automatic repeat circuit, $49.50.
California residents add 6% sales tax; 6.5%, Bay Area.
R. P. Enterprises
P.O. Box 122
Livermore, CA 94550


```
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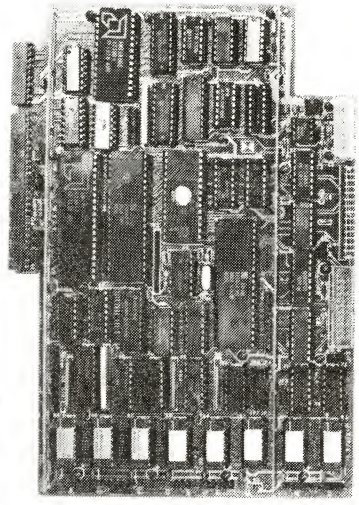
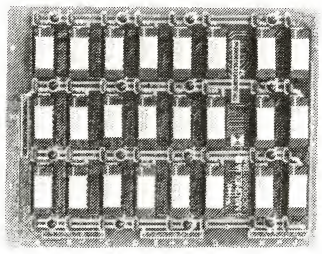
Circle #149 on Reader Service Card

INTRODUCING -- MAGNOLIA's MOST POWERFUL BOARD YET!





The Z89/90 is a good solid computer. But it does have certain limits.

We've had many requests to increase its CPU speed to 4MHz, but nothing met our standards for both field installation and reliability. And who needs anything less.

We increased its RAM to 176K with our 128K board, allowing use of MP/M™. However, without DMA, multi-user operations under MP/M are slow.

Networking '89s together has been a long-term goal of ours. Through the Corvus Constellation multiplexer we provided the first stage -- allowing computers to share Winchester disk storage. But that technique leaves much to be desired -- since each computer independently manages its disk allocation there are significant operational limitations on sharing disk files.

We first announced our impending 'RS422 Network Interface' at the 1982 West Coast Computer Faire. Our design goals included:

- RS422 Network Communication at 800K baud
- On-board Network Control and Data Buffering

As it progressed, we realized that we had designed an 'I/O Board' which was FAR MORE POWERFUL THAN THE '89 ITSELF!

After agonizing delays, the board is now in production as the '77422 Network Controller'. Compare these specifications with the Z89 itself [or the new 'upgrade' CPU boards]:

- 4MHz Z80™ CPU
- 64K RAM, 256K [bank selectable] optional
- 8 K EPROM
- 4 CHANNEL DMA controller
- 2 Serial Ports: RS422 at 500KBaud
  RS232 at up to 19.2 KBaud

We also changed its name from '77321 Network Interface' to '77422 Network Controller'. Our 773xx products must be used in a Z89/90 computer. Although this product CAN be an I/O card in an '89 or 90, it can also be used independently as a stand-alone station on the network:

- permitting a terminal [Z19 or other] as a network station [without local disk storage], or
- permitting a printer to spool data directly from the network.

Network applications software is currently being developed and tested.

Software for an exciting non-network application is included. The workload is split between the Z89/90 CPU and the CPU on the '422 board:

- The Z89's 2MHz CPU continues to run Magnolia CP/M™, handling all physical I/O [console, printer, floppy and Winchester disks]
- The '422 board's 4MHz CPU runs an interface program which 'looks like' CP/M to an application program -- but passes CP/M system calls to the Z89's CPU for execution, allowing a 63K TPA on the '422 board!

With this division, the following Z89 limitations are overcome:

- The application runs on a 4MHz CPU
- The application has 63K of RAM available, independent of BIOS size
- The DMA controller [making a slave I/O processor of the '89 board] frees the application CPU from detailed I/O functions.

This last advantage is especially significant when executing MP/M on the '422 board, using the optional bank-selectable memory.

Hardware-dependent programs [including utilities like 'format'] which perform actual physical I/O, must run on the 'slow' Z89 CPU. A special utility is provided to 'mark' those application programs which can execute more efficiently on the '422 board CPU.

The board is presently available in 64K and 256K versions which mount in an I/O slot [P504/P510] on the '89 CPU board. To limit power dissipation within the '89, no disk drive may be used internally.

64K Network Controller Board
order 77422-064-xx **$695**

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order 77422-256-xx **$1295**

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requires 77422
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Circle #134 on Reader Service Card

Program Some Improbable Prognostications

The appropriateness (or ghastliness) of the fortunes generated is determined by your humor, tact, and taste (or lack thereof).

Edward A. Byrnes

In April of 1985, reader, you are lost in the Everglades where you survive for six years eating water lily bulbs . . . you finally succcumb to a variety of diseases and die peacefully in two inches of water.

With an assist on some technical points from a friend, John Block, I wrote GYPSY.BAS for fun. The "fortunes" generated by this Microsoft BASIC program are easily modified or replaced with predictions of your own design. It can be outrageous, optimistic—or a combination of both. The prophesy of your "personal" gypsy is limited only by your imagination. So—open those data files of Creativity and Invention, and I'll guarantee smiles, if not a questioning glance, from your family and friends.

What the program does

The Gypsy in GYPSY.BAS warns users at the beginning that it is sometimes dangerous to see into the future. If they decide to proceed, they're asked to enter their name. The name is then used throughout the program "personalizing" the prompt statements and fortunes. They are next asked to enter their "lucky" number or numbers. The Gypsy processes these numbers and produces a fortune based on the numbers that are entered. If users are unhappy with the fortunes they receive, they are given the opportunity to ask for another. The fortunes I have written are all fairly undesirable. This causes users to "search" through all the fortunes. You may want to include at least one "good" fortune—so you don't get smacked.

How it works

In Line 10, CLS$ is defined as the sequence needed to clear the screen, namely "ESCape E" or CHR$(27)+"E". Once defined, Line 20 actually clears the screen (for the Gypsy introduction) with the statement PRINT CLS$. This same PRINT CLS$ statement also clears the screen at Lines 240, 320, and 1070.

RANDOMIZE PEEK(11) in Line 30 uses the always-changing number in the tic counter as the "seed" in the random number generation statements (Lines 330 and 390). By using this number as the "seed", the fortunes are rarely the same, even if the identical lucky number is entered time after time within the program.

PRINT statements with no argument come up on the screen as spaces between the lines of text that are printed. These can be added or subtracted with no effect on the execution of the program.

Lines 140 through 170 introduce the program to the user. These statements can be spruced up or replaced with your own introduction. Text can be added with additional PRINT statements using "unused" line numbers between Lines 140 and 170.

Line 190 or a similar statement is used to prompt users to enter their name. This satisfies the INPUT statement of Line 230. "N$" is then defined as that string of characters which is the user's name. Once defined, "N$" is replaced by the user's name throughout the program.

Lines 250 through 290 again prompt the users—this time for their lucky numbers. This satisfies the INPUT statement Line 320.

Line 330 defines an integer, "I", as two times the user's lucky number times the random "seed" number. In the program as it's given here, "I" must be a

```
10 CLS$=CHR$(27)+"E"   :REM DEFINE SEQUENCE TO CLEAR THE SCREEN
20 PRINT CLS$          :REM CLEAR THE SCREEN
30 RANDOMIZE PEEK(11)  :REM USE NUMBER IN TIC COUNTER AS RANDOM GENERATION SEED
40 PRINT
50 PRINT
60 PRINT
70 PRINT "                      GYPSY"
80 PRINT "                   by E.A.Byrnes"
90 PRINT "                   and J.A.Brock"
100 PRINT
110 PRINT
120 PRINT
130 PRINT
140 PRINT "WELCOME TO THE FORTUNE-TELLING WORLD OF THIS TIME AND SPACE"
150 PRINT "YOU ARE ENTERING A TRAIN OF THOUGHT THAT HAS EXISTED FOR CENTURIES"
160 PRINT "SOMETIMES IT IS DANGEROUS TO FORSEE THE FUTURE...DO SO AT YOUR OWN"
170 PRINT "RISK!"
180 PRINT
190 PRINT "TYPE IN YOUR NAME AT THIS POINT IF YOU HAVE DECIDED TO PROCEED"
200 PRINT
210 PRINT
220 PRINT
230 LINE INPUT N$       :REM N$ BECOMES THE USER'S NAME
240 PRINT CLS$          :REM THE SCREEN IS CLEARED FOR "LUCKY NUMBER" INPUT
250 PRINT "NOW PICK YOUR FAVORITE NUMBER OR NUMBERS "N$" AND ENTER THEM"
260 PRINT
270 PRINT "ON THE KEYBOARD OR KEYPAD...THEN PRESS RETURN.  YOUR NUMBERS"
280 PRINT
290 PRINT "ARE THEN RANDOMIZED AND YOUR FORTUNE IS GENERATED. GOOD LUCK "N$
300 PRINT
310 PRINT
320 INPUT I:PRINT CLS$  :REM NUMBERS ARE ENTERED BY USER   SCREEN IS CLEARED
330 LET I=INT(2*I*RND(1)):REM "I" IS USED TO PRODUCE A RANDOM NUMBER
340 PRINT
350 PRINT
360 IF I>10 THEN GOTO 370
370 LET I=INT(I/2)        :REM "I" IS DIVIDED UNTIL IT IS LESS THAN TEN
380 IF I<1 THEN GOTO 390
390 LET I=INT(10*RND(1))  :REM "I" IS MULTIPLIED TO BRING IT INTO RANGE
```

Listing 1: GYPSY.BAS was written for use under the CP/M operating system. The HDOS version of MBASIC, however, does not support the RANDOMIZE function in line 30. If you wish to use a substitute for it, the tic counter location would also have to be changed from 11 to 8219.

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```
400 IF I=1 THEN GOTO 520
410 IF I=2 THEN GOTO 570
420 IF I=3 THEN GOTO 610
430 IF I=4 THEN GOTO 650
440 IF I=5 THEN GOTO 690
450 IF I=6 THEN GOTO 730
460 IF I=7 THEN GOTO 780
470 IF I=8 THEN GOTO 830
480 IF I=9 THEN GOTO 890
490 IF I=10 THEN GOTO 940
500 PRINT
510 PRINT
520 PRINT "SORRY "N$", YOU ARE...BY MISTAKE...ACCUSED OF ROBBERY...YOU ARE"
530 PRINT "TRIED, CONVICTED AND SENTENCED TO TWENTY YEARS IN JACKSON STATE"
540 PRINT "PRISON...FORTUNATELY YOU ARE BEATEN TO A PULP BY THE OTHER"
550 PRINT "PRISONERS AFTER SIX YEARS AND DIE A YEAR AFTER THAT."
560 GOTO 1010
570 PRINT "WELL "N$" AS FAR AS I CAN SEE...YOU DO WELL FOR TWO YEARS..."
580 PRINT "AFTER THAT YOU LOSE YOUR MIND AND SPEND THE NEXT THIRTY YEARS"
590 PRINT "IN A STATE MENTAL INSTITUTION SELLING INVISIBLE MICE."
600 GOTO 1010
610 PRINT "WELL "N$", YOU FINALLY SAVE ENOUGH MONEY TO GO TO EUROPE...BUT"
620 PRINT "SOMEHOW YOU END UP IN CALCUTTA AND SPEND THE REST OF YOUR LIFE"
630 PRINT "TRYING TO PROVE YOUR AMERICAN CITIZENSHIP."
640 GOTO 1010
650 PRINT "DEAR "N$", YOU SIGN UP FOR WHAT YOU THINK IS A BOOK OF THE MONTH"
660 PRINT "CLUB...A MONTH LATER YOU ARE INDUCTED INTO THE FRENCH FOREIGN LEGION
670 PRINT "...IN 1987 YOU ARE LISTED AS MISSING IN ACTION IN NEW GUINEA."
680 GOTO 1010
690 PRINT "IN APRIL OF 1985 "N$", YOU ARE LOST IN THE EVERGLADES WHERE YOU"
700 PRINT "SURVIVE FOR SIX YEARS EATING WATER LILY BULBS...YOU FINALLY SUCCUMB"
710 PRINT "TO A VARIETY OF DISEASES AND DIE PEACEFULLY IN 2 INCHES OF WATER."
720 GOTO 1010
730 PRINT "SORRY "N$", BUT UPON LEAVING HERE YOU SLIP ON THE STEPS AND BECOME"
740 PRINT "PARALYZED...SOMEONE CLOSE TO YOU TAKES GOOD CARE OF YOU FOR 2 YEARS"
750 PRINT "...THEN THEY GET TIRED OF HELPING YOU ALL THE TIME AND DECIDE TO"
760 PRINT "KILL YOU.  AFTER 64 ATTEMPTS...YOU ARE FINALLY DONE AWAY WITH."
770 GOTO 1010
780 PRINT "LUCKY AND UNLUCKY "N$"...YOU FIND YOU ARE THE ONLY LIVING HEIR TO"
790 PRINT "A SIZEABLE FORTUNE (WORTH MORE THAN 8 MILLION DOLLARS)...BUT THEN"
800 PRINT "YOU FIND THAT THE ONLY RECORDS THAT WOULD PROVE YOUR CASE WERE"
810 PRINT "DESTROYED IN A FIRE IN 1890."
820 GOTO 1010
830 PRINT "OF ALL THE THINGS THAT COULD HAPPEN "N$", YOU GO ON A TOUR OF A"
840 PRINT "LOCAL CHEESE FACTORY, WHERE YOU BECOME SEPARATED FROM THE MAIN"
850 PRINT "TOUR GROUP.  YOU FALL INTO A VAT OF PROCESSED CHEESE (UNNOTICED)"
860 PRINT "AND FINALLY BECOME SO MANY PARTS PER MILLION IN A HUNDRED AND"
870 PRINT "FORTY-FOUR PARCELS OF SHARP CHEDDAR."
880 GOTO 1010
890 PRINT "GOOD NEWS AND BAD NEWS "N$", YOU ARE CHASED THROUGH THE WOODS WHILE"
900 PRINT "ON A CAMPING TRIP BY A PACK OF CRAZED RABBITS...YOU MAKE IT TO THE"
910 PRINT "MAIN ROAD AND ARE FLATTENED BY A BORDEN'S MILK TRUCK WHILE TRYING"
920 PRINT "TO FLAG IT DOWN."
930 GOTO 1010
940 PRINT "YOU GET A JOB WASHING WINDOWS IN A BIG CITY "N$", ON THE FIRST"
950 PRINT "DAY OF THE JOB (ON THE FIFTH FLOOR), THE PEOPLE ON THE SIDEWALK"
960 PRINT "THINK YOU ARE ABOUT TO ATTEMPT SUICIDE...THEY YELL JUMP AND"
970 PRINT "YOU LISTEN!"
980 GOTO 1010
990 PRINT
1000 PRINT
1010 PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:
1020 PRINT "IF YOU ARE UNHAPPY WITH YOUR FORTUNE "N$"...TRY FOR ANOTHER"
1030 PRINT
1040 PRINT "          ENTER 1 FOR YES"
1050 PRINT "                                ENTER 2 FOR NO"
1060 PRINT:PRINT:PRINT
1070 INPUT X:PRINT CLS$
1080 IF X=1 GOTO 240
1090 IF X=2 GOTO 1100
1100 PRINT:PRINT:PRINT
1110 PRINT "WELL GOOD LUCK "N$", MY BEST TO YOU!"
1120 END
```

whole number between 1 and 10 (including the numbers 1 and 10). INT in the equation deletes any numbers on the right side of the decimal point.

If "I" is between 1 and 10 (inclusive), it "falls through" Lines 340 to 390 and is used "as is" in the IF...GOTO statements that follow. If the result (again the number generated at Line 330) is greater than 10, it is divided by two until it is ten or less by execution of Line 370. If the result is less than ten, it is brought up into range by multiplication in Line 390.

The IF...GOTO statements (Lines 400 through 490) direct the printing of a particular fortune based on the value of "I". For example, if I=6 the computer ignores all the other IF...GOTO statements and executes Lines 730 through 770.

The fortunes I have written are all fairly undesirable. This causes users to "search" through all the fortunes.

After the fortune is printed, the user is given the opportunity to seek another fortune or to quit. Lines 1020 through 1050 are the user prompt lines. The user satisfies the INPUT statement (Line 1070) by entering a "1" for "yes" or a "2" for "no". If the user enters a "1", the program loops back to Line 250 and asks again for the user's lucky numbers. This will generate another fortune. If the user enters a "2", the "Good Luck" statement is printed by Line 1110 and the program is over when the last line in the program is executed (the END statement of Line 1120).

Adding more fortunes

For convenience's sake, GYPSY.BAS as it appears here is written for only ten fortunes. A modification of Line 390, however, will permit the insertion of additional fortunes. As it appears in the listing, Line 390 produces a number between 1 and 10. If you want twenty-

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five fortunes, say, just replace the "10" with "25". Line 390 will now produce a number between 1 and 25.

Line 390 in the listing:
390 LET I=INT(10*RND(1))
Line 390 modified:
390 LET I=INT(25*RND(1))

The number of IF...GOTO statements must be increased if Line 390 is modified for more fortunes. And of course, additional fortunes must be added toward the end of the program. Lines 400 through 490 can be renumbered, utilizing the unused line numbers for the additional IF...GOTO statements. Insert the additional fortune statements by the same method—renumber lines 520 through 980, using any or all unused line numbers.

After inserting additional fortunes, the line numbers in the argument portion of the IF...GOTO statement will have to be replaced by those line numbers that indicate the beginning of each fortune.

If Line 390 produces the number 15 (for example), then a corresponding IF...GOTO statement must direct the program to the beginning of one of the fortune statements.

456 IF I=15 THEN GOTO 962

If you have the storage capacity, it is possible to add almost any number of additional fortunes to the program. The RENUM command of Microsoft BASIC provides the means of renumbering an entire program or parts of a program. Renumbering in increments of 100 or 200 will provide the programmer with many unused line numbers. It is a command that serves well, especially if you plan on adding a wagonload of additional fortunes.

Rewriting the fortunes

Replacing the fortunes is simply a matter of making new PRINT statements at the line numbers in the program listing that contain my fortunes. Remember that "N$" will show up within the text as the user's name and should usually be followed by a comma. Each statement to be printed must begin and end with quotation marks. Be sure to follow each fortune with a GOTO statement that directs execution to the "TRY FOR ANOTHER" input prompt at Line 1010. Once you have the program up and running, you can save it in ASCII form by typing SAVE "FILE NAME",A. If you have a word processor, it can then be called up and cleaned up with ease.

Used as a skeleton, there is no limit to the modifications that can be made to this program. The introduction, user prompt statements and fortunes can all be rewritten to reflect your own personality and philosophy—give your imagination free reign and the amusement begins. Be careful though—an oracle's life is not always easy!

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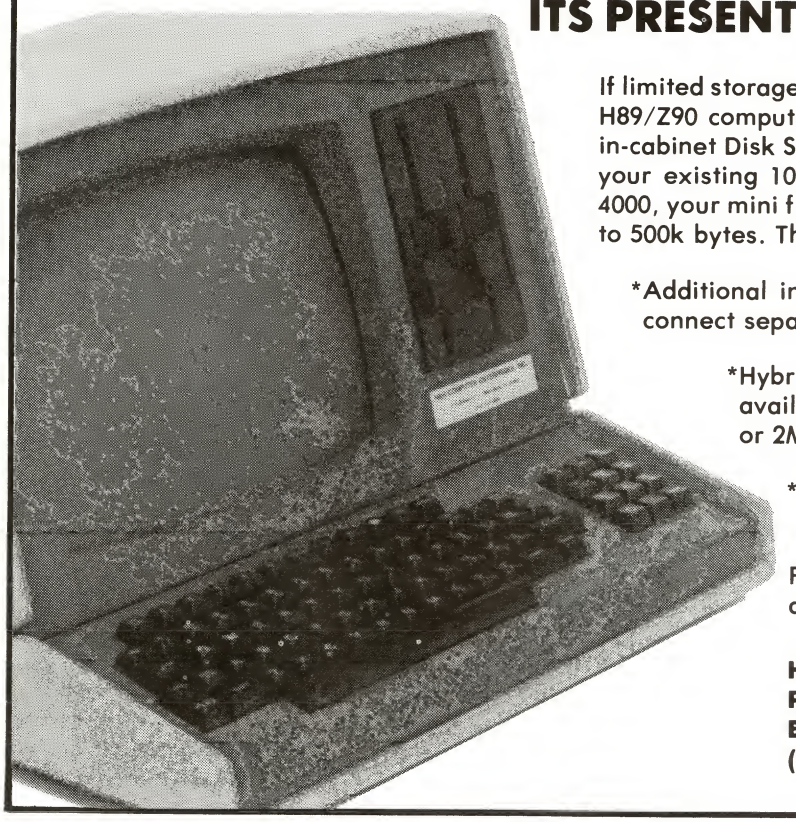

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Inside a Spooler

A look at the assembly language to divide the computer's time between output to the printer and other processing.

A. E. Dessler

Before the spooler, Man had to wait while printing out a file. This was completely unacceptable for the computer user who paid $3,000 for a system and then had to watch it print. For some unexplainable reason, computer people think that their time is valuable.

This prompted the development of the spooler. The spooler first appeared on large, multi-user systems where a method of lining up files to be printed was required. Otherwise, chaos would reign as people all attempted to access the printer at the same time. The development of the spooler quickly trickled down to the single-user microcomputer.

The advantage of the spooler is that the user can print a file while simultaneously doing other work on the system. While not a necessity on a single-user system, it does improve productivity.

Spool is an acronym for Simultaneous Peripheral Output On Line. To be precise, the spooler allows users to output data to a peripheral device while still allowing them to continue to use the system for other processing. (For more on the history of spoolers, see "Print Spoolers: A Background and Review of Six Software Products to Break your Printer Bottleneck," by Kenneth A. Patrick; *Sextant* #1, Spring 1982.)

For a long time, the Heath system did not have any spoolers available for it. Most people did not understand how the Heath Disk Operating System (HDOS) worked. However, when the HDOS source code became available, so did a plethora of spooler programs. This article is intended to give an advanced programmer an insight into one method of multi-tasking HDOS. I hope, though, that it also introduces as many readers as possible to the inner workings of spoolers—even though much of it, of course, assumes an understanding of the instruction set for the 8080 central processor unit (CPU), and a good working knowledge of device drivers. (For information on device drivers, I'd suggest "The HDOS Device Driver Programmer's Guide" by Al Dallas, Dale Lamm, and Tom Jorgenson, in *REMark* #20, September 1980.)

There are basically two types of spoolers. The first type is the true spooler. This program handles the reservation of disk space so that the user can actually write to SP: (e.g., SAVE "SP:",A or ASM PROG,SP:=PROG.ASM). When the user writes to this type of spooler, the program saves the data in the reserved disk space and then outputs it to the peripheral.

The second type requires that the user first store the data in a disk file. The user can only tell this kind of spooler to spool data already stored in a disk file. The program I present is of the second type. I feel that this is the more flexible approach if the system in question does not have tremendous amounts of disk space available.

When the HDOS source code became available, so did a plethora of spooler programs.

Starting out

The problem of the spooler is difficult. The programmer must design and implement a program that, at select times, outputs data from a file to the printer. HDOS makes this easy, however, due to the flexible and farsighted method in which it was written.

The spooler basically has two parts to it. The first decides when to output data, while the second actually outputs it.

To facilitate ease of use, data will be handled in lines whenever possible. In other words, the spooler will output the file one line at a time. Conceivably, we could write it so that it would output the file one character at a time, or even one paragraph at a time. A line is convenient because most printers have buffers big enough to accommodate 80 characters. It is a good idea to output data in chunks as big as possible. One line is about as big as we dare. Otherwise, we may fill up the print buffer. Then the system would have to wait for the printer to catch up and all advantage of the spooler would be lost.

Because lines vary in size (one may be 12 characters, another 50 characters), the program must compensate for the difference. The program must wait longer for the printer to catch up after outputting a line with 70 characters than it must after outputting a line with 20 characters. Remember, if the program outputs lines too quickly, the printer will fall behind and the system will stop and wait for the printer to catch up.

Thus, when the program outputs a line, it should wait a certain time for each character in that line. The most convenient units of time to use are provided by the tick counter (TICCNT). A TICCNT is 1/500 of a second. For an H14 printer, for example, the spooler should wait about 17 TICCNTs per character. For a Diablo, the spooler should wait about 45 TICCNTs per character.

For example, if the spooler is handed the line:

The lazy brown dog jumped

the spooler should wait (assuming an H14 printer) 442 TICCNTs. Remember, the carriage return *is* a character. Thus, we have 26 characters and the program waits 17 TICCNTs for each. This should give the printer enough time to print the line and return the print head to ready position.

The spooler as device driver

The spooler program discussed here will be implemented in the format of a device driver (.DVD). The advantage of writing it as a .DVD is that HDOS will load and relocate it into high memory automatically. The programmer does not have to worry about memory limits and about the multitude of different pointers that HDOS keeps. Using .DVD format, the programmer saves a lot of work and memory.

One thing to remember, though, is that HDOS can only support eight DVDs in memory at once. In HDOS 2.0, you *must* have a console (TT:) driver and a disk (SY:) driver. If the users have a printer, then they also have an LP: driver. The SP: driver means that the user only has four

device table entries left for additional peripherals.

The spooler program presented here is called a "pseudo device driver" because it really does not drive a peripheral. Instead, it takes information from HDOS and passes it on to the printer device driver (LP:). Most "pseudo device drivers" use the .LOAD section of their code to reset interrupt vectors for proper operation. (For more on interrupts, you might want to look at "Interrupt Programming Under HDOS," by Aaron Reynolds in *Sextant* #4, Winter 1983.)

Handling interrupt vectors

The spooler program needs two interrupt vectors. The first is for a TICCNT interrupt. This section of code counts TICCNTs and determines when the printer is ready to receive another line. The only problem with using TICCNT interrupts is that the user *cannot* execute SCALLs or do large processing—there won't be sufficient time to complete them because all TICCNT processing must be finished in 1/500th of a second. Therefore, our TICCNT processor simply decrements a word and sets a flag when the word is 0. More on this later.

The second interrupt is a system call (SCALL) interrupt. The good thing about using SCALL interrupts is that the program can take all of the time it wants to execute SCALLs. In fact, if the overlay of a particular SCALL is not loaded, then HDOS is nice enough to load it for you. Most of our program's processing will occur during SCALL interrupts.

To access an interrupt, the user goes to the UIVEC table (which starts at 40.037). UIVEC stands for User Interrupt VECtor and allows the user to steal processing time from system interrupts. Whenever a clock interrupt (TICCNT) occurs, the computer goes to location UIVEC+1 and jumps to the location stored there. In order to send the computer to your routine, you simply put the start address of your routine at UIVEC+1. Then when the interrupt occurs, the computer reads the address and jumps to your routine. It is very important, however, to save the address that was at UIVEC+1 and jump to that address when your routine is finished. The computer does very important processing at clock interrupts and failure to jump to the computer routine would be disastrous.

Probably the biggest problem in writing a spooler involves reading the data from disk.

Whenever an SCALL occurs, the computer jumps to UIVEC+19. Basically, this interrupt works the same way that the TICCNT interrupt does. When any interrupt occurs, all registers should be preserved just as they were when the interrupt occurred, and the return address is put on the top of the stack. For example, the following code would set up a TICCNT interrupt:

```
LHLD   UIVEC+1    get address of
*                 computer's routine
SHLD   endproc    save at end of
*                 our routine
LXI    H,procst   start of our
*                 routine
SHLD   UIVEC+1    make computer
*                 jump to our routine
```

This code stores the start address of your interrupt processor at the vector. Then, when the interrupt occurs and the computer goes to the vector to find out where it should go, it goes to your address. The above code also loads the jump address for the current TICCNT vector and stores it at the end of your processor. Thus, when your processor has finished, it hands control over to the original routine.

Reading and writing

Probably the biggest problem in writing a spooler involves reading the data from disk. If the program were to hold the entire file in memory, it would take up so much memory that it would never be feasible to use it. So, obviously, a spooler must only read in a small portion of the file at a time. When that small portion of the file has been printed, the program must go to disk and read more data.

So the spooler should be able to run at any time. However, if the program running while a file is spooling utilizes all channels from –1 to 5, then what channels can the spooler use to read the disk and feed the printer? The answer: channels 6 and 7.

Channels 6 and 7?! They don't exist! Well, when HDOS is first booted, they don't exist. However, it is an easy trick to define as many extra channels as you need. Our program will utilize two extra channels (6 and 7). Channel 6 will be the read channel. It will read the data from the disk file to be spooled. Channel 7 will be the write channel.

It is very important to open the printer-driver channel before writing to it. Heath, in an attempt to make HDOS "bullet-proof," wrote code into their drivers that prohibits output of data to the printer unless the driver has been opened.

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location of channel –1. The first two bytes of channel –1 contain the location of channel 0. The first two bytes of channel 0 contain the location of channel 1. The first two bytes of channel 1 contain the location of channel 2. This goes on until channel 5, which has a 0000 as the first two bytes. This 0000 signifies that this is the last channel. To create new channels, place the address of your channels at this address. Now, the program can utilize channels 6 and 7 as if they were part of stock HDOS.

That solves one problem. One problem is created, though. The spooler should be able to run while other programs are running. The user should be able to go into BASIC, run a program, go into an editor, assemble a file, catalog a disk, all while a file is spooling. However, most programs cause SCALL .EXITs to occur. Whenever an SCALL .EXIT is executed, HDOS starts at channel –1 and works its way up the table clearing every channel. Also, any program that has an SCALL .CLEARA in it will be similarly disastrous. It doesn't care if you've created any channels of your own, it simply clears them.

There are a few ways to handle this. First, your program could intercept SCALL .CLEARAs and handle them itself. However, this approach would consume memory. A simpler approach would be to make channels 6 and 7 "appear" and "disappear" as needed. This is very easy. Whenever the program needs to read or write to channels 6 or 7, the program puts the address of its channel 6 at the link address of channel 5. Then, when it has finished reading and writing, it puts a 0000 at the first two bytes of channel 5. Eureka! When HDOS executes a .CLEARA, it links through the channel table and zaps all channels. However, the spooler's channels are not affected because they have been buffered. However, all pertinent data has been saved and the channels are accessable as needed.

Some particulars

There are several programming techniques that appear quite a bit in the code for the spooler given here. I set a lot of flags to 1 if something is supposed to happen. I test for this two ways: First, I can test to see whether the flag is zero:

```
LDA flag          Load flag into
*                 accumulator(A register)
ANA A
JZ (or JNZ) label
```

ANA A sets the "z" flag if the accumulator is zero. Second, I can test to see whether the flag is one:

```
LDA flag
DCR A
JZ (or JNZ) label
```

DCR A sets the "z" flag if the accumulator is one. It also destroys the accumulator's value (sets it to 0). This is very helpful in some cases. Both of these techniques save memory. CPI 0 and CPI 1 are both two-byte instructions, while ANA A and DCR A are one-byte instructions.

The spooler itself is easy to operate. When you want to spool a program, you need only type:

```
>COPY SP:=TT:
fname <cntrl-d>
```

This causes the file "fname" to be spooled.

Only one file may be spooled at any one time. Thus, if you try to COPY a file name to SP: while spooling at the same time, an error will occur.

Another thing to look for is RESETting the drive that is being spooled from. The spooler makes *no* checks to keep the user from RESETting or DISMOUNTing the disk that is being spooled from. Users must make their own checks and try to remember not to do anything that could in any way affect the file being spooled from.

The spooler presented here is a stripped-down version of a spooler I

Listing 2: ABO.ASM allows the user to abort the spooler without aborting HDOS. Without ABOrt, once the spooler starts, it is impossible to stop without exiting HDOS.

ABOrt stops the spooler by calling it with DC.ABT in the accumulator. When the spooler sees this, it aborts and resets internal flags so it can spool another file.

In order to send DC.ABT to the spooler, the spooler must call the entry code directly — it cannot use SCALLs. It gets the address of the entry code by using the .LOADD SCALL. Then it merely calls the spooler with the accumulator set appropriately.

Section B. This code does a .LOADD on the spooler. If the spooler is already resident (which it should be), then the .LOADD simply loads all addresses into the Action I/O Table.

Section C. The next two lines patch the location CAS with the address of SP:'s entry code. This allows the program to get to SP: without using SCALLs.

Section D. When SP: returns, if 'c' is set, then there was an unsuccessful abort. Otherwise, the abort was successful.

```
          TITLE   'Abort'
          STL     'Andy Dessler 12-Jun-82'
***       This program is designed to send a 'device abort' code
*         (DC.ABT) to the spooler. The spooler has been designed to
*         abort spooling when this code is received.
          XTEXT   HOSEQU                                          A
          XTEXT   HOSDEF
          XTEXT   DIRDEF
          XTEXT   ESINT
          XTEXT   DDDEF
$TYPTX    EQU     31136A
          ORG     USERFWA
          CALL    $TYPTX
          DB      12Q,'Spooler Aborting . . ','.'+200Q

          LXI     H,SNAME                                         B
          SCALL   .LOADD          LOAD DEVICE TO GET ADDRESS

          LHLD    AIO.DDA
          SHLD    CAS+1           PATCH LOCATION FOR CORRECT CALLING
          MVI     A,DC.ABT                                        C
CAS       CALL    0
          JC      ERROR

          CALL    $TYPTX                                          D
          DB      ' Successful Abort!',12Q,212Q
          JMP     EXIT
ERROR     CALL    $TYPTX
          DB      ' ERROR Task Not Aborted!',12Q,212Q
EXIT      XRA     A
          SCALL   .EXIT
SNAME     DB      'SP:',0
          END     USERFWA
```

```
00281 Statements Assembled
37805 Bytes Free
 No Errors Detected
```

wrote for Newline Software of Littleton, Massachusetts. The version that they sell is more than twice as long and has many more features: enhanced queue ability; abort on control character; RESET and DISMOUNT error checking; TICCNTS per character SETtable through set code; and many other features.

The program: piece by piece

Well, let's take a look at the spooler section by section. As you can see, the section numbers in the text below refer to those in the accompanying code.

Section **2**: This code is the device driver header code. This code tells HDOS that the file is a .DVD with no SETtable options (i.e., no SET code). Also, only one device (SP0:) is recognized. This device is not a directory device and is capable only of writes. The user cannot read from it. (For more information, see "The HDOS Device Driver Programmer's Guide," Dallas, Lamm, Jorgenson, noted above; or Bill Parrott's article, "Crucial Secrets of HDOS Let You Write Device-Independent Programs," *Sextant* #2, Summer 1982.)

Section **3**: Whenever any action concerning the spooler is taken (e.g., .WRITE, .READ, etc.), HDOS goes to the entry code and lets the device driver take the action for itself. The only SCALLS allowed by SP: are: .WRITE, .LOAD, .OPENW, and .CLOSE. Typically, the way the spooler works is this: immediately after boot up, the user loads the spooler. SYSCMD issues an SCALL .LOADD which causes the "load" code of this spooler to be executed. This code's main objective is to get the spooler in running condition.

Now, whenever you want to spool a file, you need only type:

>COPY SP:=TT:

fname <cntrl-d>

Then HDOS is sent here with the 8080's register pair DE pointing at "fname" and DC.WRI in register A. The program then goes to WRITE and begins spooling.

Note: the label OPWL is patched because the spooler will not work until it has been loaded. Thus, the initial setup forces any attempt to .OPENW to fail. However, once the spooler is loaded (via .LOADD), the label OPWL is patched and proper execution may continue.

The DC.CLO routine (where execution goes for an SCALL .CLOSE) simply clears the flags and returns. Nothing of any importance is accomplished. However, HDOS expects to be able to .CLOSE any file without error. Thus, this is necessary.

Section **4**: The .WRITE code is very important. When the user runs this program, he copies the file name to SP: through the copy command (or any .WRITE code). Then, HDOS passes the file name to SP:. When the write subroutine is entered, the DE register pair is pointing at the start of the file name. Either a carriage return or null delimits the name.

The first thing the routine does is copy the file name from the PIP buffer into the spooler's internal buffer.

Section **5**: The subroutine ACT is very important and used frequently. This routine creates two new channels in HDOS that are located above the high channel. In standard HDOS, the two new channels are 6 and 7. The variable CHAN contains the number of the low channel created.

After creating the two new channels, the program opens the file given on the first new channel. From here on out, this channel will be called channel 6. The second new channel will be referred to as channel 7. After opening the file to be spooled on channel 6, the spooler fills its buffer with the file. If the buffer holds the entire file, then the flag EOF is set to a non-zero number. If the file is larger

Listing 1: SPOOL.ASM is intended to show the essentials of a spooler.

```
        TITLE   'Universal Spooler, Version 1.0'
        STL     'Andy Dessler 10-Jun-82'
***     This is a fully operational spooler that is designed to work with
*       any valid HDOS system.  It contains two interrupt intercepters.
*       Written for publication in Sextant.
PAGE    EQU     4               NUMBER OF PAGES TO KEEP RESIDENT IN MEMORY
*                               AT ONCE
        XTEXT   HOSDEF                                                  1
        XTEXT   HOSEQU
        XTEXT   DIRDEF
        XTEXT   ESVAL
        XTEXT   ESINT
        XTEXT   PICDEF
        XTEXT   DDDEF
        XTEXT   DEVDEF
        XTEXT   DVDDEF
        XTEXT   ECDEF
        XTEXT   MTR
$COMP   EQU     030060A
$HLIHL  EQU     030211A
$MU66   EQU     030337A
$RSTALL EQU     031047A                 H17 ROM CODE SUBROUTINE
$SAVALL EQU     031054A
$TYPTX  EQU     031136A
$ZERO   EQU     031212A

        STL     'Device Header Code'                                    2
        EJECT
        CODE    PIC
        DB      DVDFLV          DEVICE DRIVER FLAG
        DB      DT.CW           CAPABLE OF WRITES ONLY
        DB      1
        DB      1               ONLY 1 UNIT (SP0:)
        DB      DT.CW
        DB      0               NO SET CODE
        DW      0
        CODE    -REL
$       SET     *
        CODE    +REL
        DS      DVD.ENT-$       RESERVE SPACE TO START OF CODE

        STL     'Device Driver Entry Code'                              3
        EJECT
ENTRY   CPI     DC.WRI          WRITE?
        JZ      WRITE
        CPI     DC.LOD          LOAD?
        JZ      LOAD
        CPI     DC.OPW          OPENW?
OPWL    JZ      NLOA                    ; This location patched after load
        CPI     DC.CLO          CLOSE?
        JZ      CLSP
        CPI     DC.ABT          ABORT?
        JZ      ABO
        MVI     A,EC.ILR
        STC                     ILLEGAL FUNCTION REQUEST, ERROR FLAGGED
        RET

        STL     'Write Code'                                            4
        EJECT
WRITE   EQU     *
        LXI     H,FNAME
WRT0    LDAX    D               GET CHARACTER
        CPI     12Q             <CR>?
        JZ      WRT1
        ANA     A               0?
        JZ      WRT1
        MOV     M,A             STORE CHARACTER
        INX     H
        INX     D
        JMP     WRT0
WRT1    MVI     M,00            DELIMIT FILE NAME
        CALL    ZBF             ZERO BUFFER AREA
```

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than the buffer (i.e., multiple reads are required), then EOF is zero.

Section **6**: DCH is the counterpart of ACT. DCH unlinks the channels that ACT made. However, all data in the channels are preserved. Thus, in standard HDOS, ACT links channels 6 and 7 while DCT will unlink the channels.

It is very important for the operation of the spooler that the spooler never return to HDOS or any user program with channels 6 and 7 linked in. This is important because certain SCALLS (.EXIT and .CLEARA) will clear **all** channels, not just –1 to 5. In order to protect the high channels (and keep HDOS from closing them when the user exits a program and goes into HDOS), SP: will always relink the channel table before program execution is handed back to HDOS. For more information, see the ACT and DCH subroutines.

Section **7**: This code opens the device driver on channel 7.

Then the program sets all program flags for normal operation. It resets CLOSEF, READF to zero. These flags tell the SCALL processor when it needs to close the input file or read another buffer full of the input file. (More on these later.) JOBREQ and PUTLINE are both set to one. Any time the spooler is running, JOBREQ is set to 1. Whenever the spooler thinks that the printer is ready for another line of information, PUTLINE is set to 1. POINT is a pointer into the data buffer that tells the spooler the next character to be printed.

Section **8**: Since the spooler can only spool one file at a time, the following two lines patch the entry code so that any SCALL OPENW to SP: during a spool will cause an error and a busy message.

Section **9**: The LOAD code is only executed once. For that reason, after it is executed, it is written over and used as buffer area.

The code has two main responsibilities: load the driver that will be used, and patch HDOS so that the spooler will work.

The first section of code asks the user for the driver name and reads it in.

Section **10**: This code uses the .LOADD SCALL to load the driver that the user specified. The program does not need to lock this driver into memory because SYSCMD will do it when the program returns. However, we did need to lock SP: into memory because no one else would do it for us.

Then the next two lines patch the spooler to call the user-specified driver. The cell AIO.DDA contains the address of the entry code for the driver just loaded. The spooler needs this address so it can call the driver without having to go through HDOS (i.e., call the driver without using SCALLS).

```
        CALL    ACT             CREATE 2 NEW CHANNELS IN CHANNEL TABLE      5
        LDA     CHAN
        LXI     H,FNAME
        LXI     D,DEFT
        SCALL   .OPENR          OPEN NEW FILE FOR READ ON CREATED CHANNEL
        JC      ERROR
        LDA     CHAN
        LXI     B,256*PAGE      READ 'PAGE' SECTORS FROM DISK
        LXI     D,BUFF
        SCALL   .READ
        JNC     WRT2
        STA     EOF             STORE ERROR
        CPI     EC.EOF          EOF? (THAT IS NOT FATAL)
        JZ      WRT2
ERROR   PUSH    PSW
        LDA     CHAN
        PUSH    PSW
        SCALL   .CLEAR          CLEAR USER CREATED CHANNEL #1
        POP     PSW
        INR     A
        SCALL   .CLEAR          CLEAR USER CREATED CHANNEL #2
        POP     PSW

        CALL    DCH             DESTROY USER CREATED CHANNELS               6
        STC
        RET

WRT2    LXI     H,DNAME         OPEN DEVICE DRIVER ON USER CREATED CHANNEL 2
        LDA     CHAN                                                        7
        INR     A
        SCALL   .OPENW
        JC      ERROR
        CALL    DCH             DESTORY USER CREATED CHANNELS
        LXI     H,BUFF
        SHLD    POINT
        XRA     A
        STA     CLOSEF          CLOSE FILE FLAG
        STA     READF           READ FILE FLAG
        INR     A
        STA     JOBREQ          1 = JOB REQUESTED
        STA     PUTLINE         1 = LINE READY TO OUTPUT
```

```
        LXI     H,BUSY                                          8
        SHLD    OPWL+1          PATCH TO GIVE USER ERROR MESSAGE
CLSP    ANA     A               NO ERROR
        RET
BUFF    EQU     *

        STL     'Load Code'                                     9
        EJECT
LOAD    EQU     *
        CALL    $TYPTX
        DB      12Q,12Q,'SP: Spooler',12Q
        DB      'By Andy Dessler',12Q,12Q
        DB      9,'Output Device Driver?',' '+200Q
        LXI     H,DNAME
LD0     SCALL   .SCIN
        JC      LD0
        CPI     12Q             <CR>?
        JZ      LD1
        CALL    MCU             CONVERT TO UPPER CASE
        MOV     M,A
        INX     H
        JMP     LD0
LD1     MVI     M,00            END OF DEVICE NAME FLAG
*       LOCK THE SP: DEVICE DRIVER INTO DEVICE TABLE
        LHLD    S.SYSM
        SHLD    S.RFWA          GET FWA RESIDENT SYSTEM
        LHLD    AIO.DTA
        LXI     D,DEV.RES       OFFSET TO RESIDENCY FLAG
        DAD     D
        MOV     A,M
        ORI     DR.PR           FLAG DRIVER AS PERMANENT
        MOV     M,A

*       LOAD OUTPUT DRIVER AND PATCH SP: FOR INTERNAL OPERATION  10
        LXI     H,DNAME
        SCALL   .LOADD
        LHLD    AIO.DDA         GET TARGET DRIVER ADDRESS
        SHLD    CADEV+1
        DI                      NO INTERRUPTS

        LHLD    .UIVEC+19                                       11
        SHLD    EXSCAL+1
        LXI     H,SCST
        SHLD    .UIVEC+19       REVECTOR SCALL INTERRUPT

        LHLD    .UIVEC+1                                        12
        SHLD    EXCLOC+1
        LXI     H,CLST
        SHLD    .UIVEC+1        REVECTOR TICCNT INTERRUPT
        EI

        LXI     H,CLSP                                          13
        SHLD    OPWL+1          PATCH LOCATION SO DRIVER CAN OPEN
        ANA     A               NO ERROR
        RET
NLOA    CALL    $TYPTX
        DB      12Q,'SP -- SP: driver not loaded!',12Q,212Q
        SCALL   .EXIT
        HLT                     * SHOULD NOT OCCUR *
$B      EQU     *-BUFF
        DS      256*PAGE-$B
EOB     DB      0FFH

        STL     'Clock Intercepter'                             14
        EJECT
CLST    DI

        LDA     JOBREQ                                          15
        DCR     A
        JNZ     OUTCL           DON'T COUNT IF JOB NOT IN ACTION

        LHLD    COUNT                                           16
        DCX     H
        SHLD    COUNT           DECREMENT COUNT
        MOV     A,H
        ORA     L               COUNT = 0?
        JNZ     OUTCL
        INR     A               FLAG LINE TO BE OUTPUTTED AT NEXT OPPORTUNITY
        STA     PUTLINE
OUTCL   EI
EXCLOC  JMP     0       ; jump is patched

        STL     'SCALL Intercepter'                             17
        EJECT
```

Section **11**: This section resets the SCALL vector. Every time an SCALL is executed, HDOS views address .UIVEC +19 and goes to the routine stored there. This section replaces the address stored there with the address of our routine. Thus, every time an SCALL is executed, HDOS jumps to our routine. However, very important processing occurs at SCALL interrupts. Therefore we need to jump to the routine that was originally in the vector after our routine is finished. That is the reason we load what was originally at the vector and store it at the end of our routine.

Section **12**: The next four lines reset the clock interrupt vector. This vector fires every 2 milliseconds.

Section **13**: The next two lines patch entry code to allow the spooler to run. Before, the entry code was patched so that any .OPENW would cause an error because the spooler cannot run without being loaded. However, now that the spooler is loaded, the program repatches the code so that proper operation will result.

Section **14**: The clock routine keeps track of the time for the spooler. It decides when enough time has elapsed that the program can output another line without the fear of overrunning the printer buffer.

Section **15**: This code decides whether the spooler is running. If JOBREQ is 1, the spooler is operational.

Section **16**: COUNT is a 16-bit word that contains the number of TICCNTS that the spooler must wait before the printer is ready to receive another line. The word COUNT is initially set in the SCALL routine. This routine decrements COUNT every 2 milliseconds. When COUNT gets to zero, then the printer is ready for another line and PUTLINE is set to 1. If COUNT is not zero, the routine exits leaving PUTLINE at zero.

Section **17**: When the flag PUTLINE is set to 1, this routine will output a line to the printer. This routine also takes care of refilling the buffer when the spooler finishes with the current buffer. If the program comes to the end of the file, then this routine will close the file and reset all program parameters.

Section **18**: The first thing the routine does is test JOBREQ. If no file is being spooled, the program immediately exits to HDOS.

Section **19**: The variable PUTLINE tells the spooler when the printer is ready to accept another line. If PUTLINE is 1 (PUTLINE is set in the Clock Intercepter Routine), then the spooler will output a line.

Section **20**: The 16-bit word POINT contains the address of the next character to be outputted. The regis-

ter pair BC counts the number of characters that the line contains.

Section **21**: *Tabs* are treated specially by going to the routine CTD. This is necessary because it can take the printer the same amount of time to print a tab as it does to print eight spaces. If the program treated the tab as one character, the printer buffer could get run over and HDOS would lock up and wait for the printer to catch up. However, a tab will usually represent fewer than eight spaces. Therefore, the spooler counts each tab as only six characters. On the average, this will accurately represent the true character count.

Section **22**: The INX B instruction increments the BC register pair and keeps track of how many characters are in this line.

Section **23**: A carriage return signals the end of the line. When this character is encountered, the program goes on and outputs it to the printer.

Section **24**: An FF (hexadecimal) character signals the end of the buffer. When this character is encountered, the program outputs the partial line and goes to the disk section of this routine to decide whether the file is finished or whether the program needs to read another buffer-full.

Section **25**: The HL registers point to the location of the next character in the buffer. The top of the stack points to the first character of the line.

Section **26**: The program comes to SCSPEC only if it has encountered an "end of buffer" character FF (hex).

The flag EOF determines whether the file is finished or the program needs to read more of the file. If EOF is 0, then the program needs to read more. If EOF is anything else, then the spool is finished and the routine will handle it.

Section **27**: This code zeroes the JOBREQ flag telling the program that the spool is finished. Also, the flag CLOSEF is set to 1. This says that the file will be closed at the next opportunity.

Section **28**: The program comes here if EOF was 0. The next two lines set the READF flag to 1. This says that the spooler will read another buffer-full at the next opportunity.

Section **29**: At this point, BC contains the number of characters in the line (including the carriage returns). The program saves the number of characters on the stack and proceeds to call ATD. ATD is a routine that adds the tab displacement as discussed in Section 21 above. Thus, the routine adds 5 to BC for every tab.

Section **30**: The next routine converts the number of characters to the number of TICCNTS that the printer

```
SCST    PUSH    PSW                                              18
        LDA     JOBREQ          EXIT SUBROUTINE IF JOB NOT OPERATION
        ANA     A               0 MEANS NO JOB
        JNZ     SCST0
        POP     PSW             RESTORE STACK
        JMP     EXSCAL

SCST0   LDA     PUTLINE         TIME TO OUTPUT A LINE?           19
        DCR     A               1 = TIME TO PUNT LINE
        JNZ     OUTSC
        STA     PUTLINE         RESET PUTLINE TO 0
        PUSH    H
        PUSH    B               SAVE REGISTERS
        PUSH    D

        LHLD    POINT           GET BUFFER POINTER               20
        CALL    DLN             DELETE LEADING NULLS
        PUSH    H               SAVE POSITION
        LXI     B,0             CHARACTER COUNTER
SCST1   MOV     A,M

        CPI     9               TAB?
        CZ      CTD             COMPUTE TAB DISPLACEMENT         21

        INX     B                                                22

        CPI     12Q             CR?                              23
        JZ      SCST2

        INR     A               END OF BUFFER FLAG?              24
        JZ      SCSPEC

        INX     H                                                25
        JMP     SCST1

SCSPEC  LDA     EOF                                              26
        ANA     A               0 MEANS MORE FILE . . . ELSE EOF
        JZ      SCSPEC0

        STA     JOBREQ          FILE FINISHED, ERASE JOB REQUESTED FLAG  27
        INR     A
        STA     CLOSEF          FLAG FILES TO BE CLOSED
        JMP     SCST2

SCSPEC0 INR     A
        STA     READF           FLAG BUFFER TO BE REFILLED WITH DATA FROM FILE
SCST2   INX     H               POINT AFTER CR                   28
        SHLD    POINT           NEW POINTER

        PUSH    B               SAVE COUNT OF CHARACTERS         29
        CALL    ATD             ADD TAB DISPLACEMENT

        LHLD    CYCPC           GET CPU CYCLES PER CHARACTER     30
        XCHG
        CALL    $MU66
        SHLD    COUNT           RESET NEW TICCNT COUNT
        POP     B
        POP     D               (BC)=COUNT, (DE)=BUFFER
        MVI     A,DC.WRI

CADEV   CALL    0       THIS LOCATION IS PATCHED WHEN THE PROGRAM IS LOADED
        LDA     CLOSEF          SHOULD WE CLOSE FILES?           31
        DCR     A               1 = YES
        JNZ     RFILE

CFILE   CALL    ACT             MAKE NEW CHANNELS APPEAR         32
        LDA     CHAN
        PUSH    PSW             SAVE CHANNEL
        SCALL   .CLOSE          CLOSE READ CHANNEL
        POP     PSW
        INR     A
        SCALL   .CLOSE          CLOSE WRITE CHANNEL
        CALL    DCH             DESTROY NEW CHANNELS
        LXI     H,CLSP
        SHLD    OPWL+1          REPATCH TO ALLOW FOR PROPER OPERATION
        JMP     REST
RFILE   LDA     READF           READ MORE DATA?
        DCR     A               1 = YES
        JNZ     REST

        STA     READF           RESET READF FLAG                 33
RFILE.  CALL    ZBF             ZERO BUFFER AREA
        CALL    ACT             MAKE CHANNELS APPEAR
        LDA     CHAN
        LXI     D,BUFF
        LXI     B,256*PAGE
        SCALL   .READ           READ MORE SECTORS
        JNC     RFILE0
```

```
        STA     EOF             STORE ERROR AT 'EOF'                    34
        CPI     EC.EOF          EOF IS AN OK ERROR
        JZ      RFILE0

        XRA     A                                                       35
        STA     JOBREQ          ERROR OTHER THAN EOF OCCURRED, ABORT!
        JMP     CFILE
RFILE0  CALL    DCH             DESTROY CHANNELS
        LXI     H,BUFF
        SHLD    POINT

        MVI     A,1                                                     36
        STA     JOBREQ          FLAG JOB IN OPERATION
        STA     PUTLINE         FLAG DATA READY FOR TRANSMISSION
REST    POP     D
        POP     B               RESTORE REGISTERS AS WE FOUND THEM
        POP     H
OUTSC   POP     PSW
EXSCAL  JMP     0
        STL     'Spooler Subroutines'
        EJECT
***     Delete Leading Nulls
*       Entry: (HL) points to character string
*       Exit: (HL) points to first non-null character of string
DLN     MOV     A,M

        INR     A               IS BYTE 0FFH (END OF BUFFER FLAG)?      37
        JZ      OUT
        DCR     A               IS BYTE NULL?
        RNZ                     RETURN FOR NON-NULL
        INX     H
        JMP     DLN

OUT     STA     JOBREQ          TEMPORARILY STOP JOB                    38
        POP     PSW             POP RETURN ADDRESS
        LDA     EOF             MORE FILE TO GO?
        ANA     A               0 MEANS YES
        JNZ     CFILE           jump here if spool finished
        JMP     RFILE.          jump here if more file to be printed
***     Compute Tab Displacement
*       This subroutine counts the number of tabs in a line

CTD     LDA     TABC                                                    39
        INR     A
        STA     TABC            ADD ONE TO TAB COUNT
        RET
***     Account for Tab Displacement
*       Entry: (BC) = count for line
*       Exit: (BC) = adjusted count for line

ATD     LDA     TABC                                                    40
        ANA     A               NO TABS?
        RZ
ADT0    INX     B
        INX     B
        INX     B               COUNT TAB AS 6 SPACES
        INX     B
        INX     B
        DCR     A
        JNZ     ADT0
        STA     TABC            RESET VARIABLE
        RET

***     Arrange Channel Table                                           41
*       Entry: none
*       Exit: none
*       Uses: none
ACT     CALL    $SAVALL
        LHLD    S.CFWA          GET POINTER TO CHANNEL -1
        MVI     B,-1
ACT0    MOV     A,L
        ORA     H               IF (HL) = 0, THEN NO MORE CHANNELS
        JZ      ACT1
        INR     B               BUMP CHANNEL COUNTER
        SHLD    ADDR
        CALL    $HLIHL
        JMP     ACT0
ACT1    LXI     D,IOCHAN        NEW IO CHANNEL ADDRESS THAT WE WILL USE
        LHLD    ADDR            addr is the address of the 1st byte of chan 5
        MOV     M,E
        INX     H
        MOV     M,D             STORE ADDRESS OF CHANNEL AT LINK OF THE LAST
        MOV     A,B
        STA     CHAN            STORE NUMBER OF LOW CHANNEL
        JMP     $RSTALL
```

must wait. This is computed by multiplying the number of characters by the number of TICCNTs per character. The result is stored in the 16-bit word COUNT. Then, at every TICCNT, this word is decremented. When the word is zero, the printer is ready for another line.

Section **31**: At this point, the line is sent to the printer. The CALL 0 below is patched with the location AIO.DDA obtained immediately after loading the printer driver. Since this routine calls the DVD entry code directly, the accumulator is loaded with DC.WRI, and the BC register pair is loaded with the number of characters. The DE register pair points at the first character to be written.

Section **32**: This code is only executed if CFILE is set to 1. It first activates channels 6 and 7 and immediately closes them. Then, those channels are deactivated. The program then repatches itself so that an SCALL .WRITE will succeed. The location OPWL had been patched to prevent someone from trying to operate the spooler in the middle of a spool.

Section **33**: If the READF flag is set to 1, this code is executed. When this is executed, the program links channels 6 and 7 into existence and reads another buffer-full off channel 6.

Section **34**: If an "end of file" is encountered, then EOF is set to 1. This means that no more of the file exists and when this buffer is finished, the file is finished. If an "end of file" is not encountered, then EOF is set to 0.

Section **35**: If another error (other than "end of file") is encountered, JOBREQ is reset, signalling that the job is over and the program jumps to CFILE which closes all files and ends the spool.

Section **36**: After a successful read, the program resets flags that allow proper operation when execution continues.

Section **37**: If the byte is FF (hex), then the buffer is finished and the program jumps to OUT.

Section **38**: Here, the program decides whether the file is finished and jumps to the appropriate routine.

Section **39**: When the program executes this routine, the code simply increments the variable TABC. TABC contains the number of tabs in a line.

Section **40**: This routine adds 5 to BC for every tab. In other words, it allows the program to assume that every tab is 6 characters in order to realistically account for the amount of time it takes to print a tab. The routine uses the variable TABC computed in the routine CTD.

Section **41**: The routine ACT, as said before, links in two new channels on top of the high channel in HDOS. The

channel table is set up very simply: S.CFWA contains the address of channel –1. The first two bytes of channel –1 point to channel 0. The first two bytes of 0 point to 1. This goes on until channel 5, whose first two bytes are 0.

This routine replaces the first two bytes of channel 5 (the high channel) with the address of our IOCHAN. The first two bytes of IOCHAN are the address of IOCHAN1, the second of our new channels. The first two bytes of IOCHAN1 are zero, showing the end of the channel table.

The routine also stores the new low channel number (i.e., 6 or 7) in the byte CHAN.

Section **42**: DCH restores the 00 to the first two bytes of channel 5. Thus, to HDOS, after DCH is called, channels 6 and 7 do not exist. Therefore they are not cleared on SCALL .EXITs and .CLEARAs. This is extremely important because it gives the spooler the ability to keep its files open no matter what HDOS is doing.

Section **43**: When the program ABO.ASM (Listing 2) is run, this routine is called. When it is called, the word POINT, which points at the next character to be printed, is set to point at a byte containing FF (hex). Then the cell EOF is set to some non-zero value, signifying that when this buffer is finished, the file is finished. When the program goes to print another line, it encounters the FF (hex) which tells it that this buffer is finished. Then it looks at EOF which tells it that the file is finished. Finally, the CFILE routine is called, which ends the spool.

Section **44**: CYCPC is the default number of TICCNTs to wait for each character that the printer prints; 17 is proper for an H14. If your printer is slower, raise the value; 45 is good for a Diablo. If your printer is faster, lower the value; an H25 could probably handle 15.

Ordering Information

The spooler presented in this article is a stripped-down version of a spooler written by the author for sale commercially:

Universal Spooler, $29.95
source code included
Note: your device driver must conform to HDOS standard for device drivers.
Newline Software
P.O. Box 402
Littleton, MA 01460
617/486-8535, evenings and weekends

```
***     Destroy CHannels                                          42
*       Entry: none
*       Exit: none
*       Uses: none
DCH     CALL    $SAVALL
        LHLD    ADDR            GET ADDRESS OF LAST VALID HDOS CHANNEL
        MVI     M,00
        INX     H
        MVI     M,00            STORE 00 AT LINK ADDRESS
        JMP     $RSTALL
***     Map Character to Upper case
*       Entry: (A) = character
*       Exit: (A) is upper case
MCU     CPI     60H
        RC
        SUI     20H
        RET
***     Zero BuFfer
*       This subroutine fills the buffer with zeros
ZBF     MVI     E,PAGE+1
        LXI     H,BUFF
ZBF0    DCR     E
        RZ
        PUSH    H
        MVI     B,00
        CALL    $ZERO           ZERO BLOCK OF 256 BYTES
        POP     H
        INR     H               BUMP HL BY 256
        JMP     ZBF0
***     BUSY
*       Notify user that SP: is busy with current job
*       NOTE: There is no return from this routine!
BUSY    CALL    $TYPTX
        DB      12Q,'SP -- SP: currently spooling!',12Q,212Q
        SCALL   .EXIT
        HLT                     * SHOULD NOT OCCUR *
***     ABOrt
*       This subroutine sets up the spooler to abort at the next SCALL.

ABO     LDA     JOBREQ          JOB REQUESTED?                    43
        DCR     A               1 = YES
        JNZ     ABO1
        LXI     H,EOB
        SHLD    POINT           POINT BUFFER AT END OF BUFFER
        INR     A
        STA     EOF             STORE NON-ZERO VALUE AT 'EOF'
        ANA     A
        RET
ABO1    STC                     FLAG ERROR
        RET
        STL     'System Definitions'
        EJECT
FNAME   DB      'Andex Industries Spooler'
DNAME   DB      '10-Jun-82'
DEFT    DB      'SY0',0,0,0
CHAN    DB      0
EOF     DB      0
POINT   DW      0
JOBREQ  DB      0
CLOSEF  DB      0
READF   DB      0
PUTLINE DB      0
COUNT   DW      0

CYCPC   DW      17              MODIFY FOR YOUR PRINTER           44
TABC    DB      0
ADDR    DW      0
IOCHAN  DW      IOCHAN1         LINK TO NEXT CHANNEL
        DW      0,0,0,0,0,0,0,0,0,0,0,0,0,0
        DW      0,0,0,0,0,0,0,0,0,0,0,0,0,0
IOCHAN1 DW      0
        DW      0,0,0,0,0,0,0,0,0,0,0,0,0,0
        DW      0,0,0,0,0,0,0,0,0,0,0,0,0,0
        END
```

```
01086 Statements Assembled
35377 Bytes Free
 No Errors Detected
```


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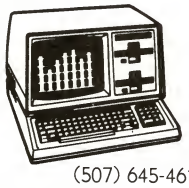

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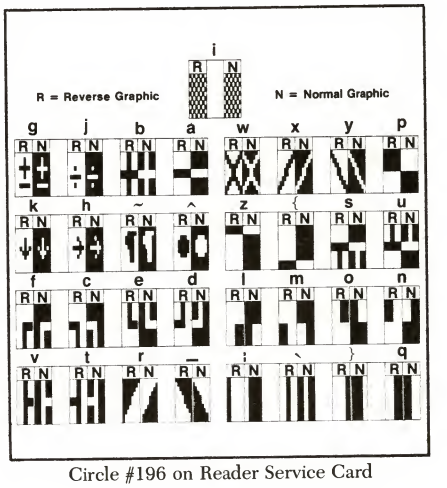
Nanos Computer Systems has created reference cards for HDOS and the Z80 microprocessor. The reference cards fold up, accordian-style, to 8½" x 3¾" in size to fit in a shirt pocket. They are printed on sturdy 80 lb. cover stock or similar material.

The HDOS reference card is 22 pages long. In addition to the operating system itself, the card covers BASIC, EDIT, the H19 terminal, PAM-8 and H17 ROM routines, I/O port assignments, ASM, DBUG, and the computer memory map. HDOS commands, utilities, error messages, system calls, and boot procedures are summarized. The price is $5.95.

The Z80 microprocessor card has 16 pages. Operation codes are listed by hexadecimal value, in mnemonic sequence, and in functional groups. The card includes timing information and lists the microprocessor flags affected by various instructions. The price is $4.95.

For additional information, write to: Nanos Systems, Attn: Paul Nanos, P.O. Box 24344, Speedway, IN, 46224 (317/244-4078).

H19 terminal graphics are summarized in one of the tables listing information for HDOS users in the HDOS reference card from Nanos Systems.



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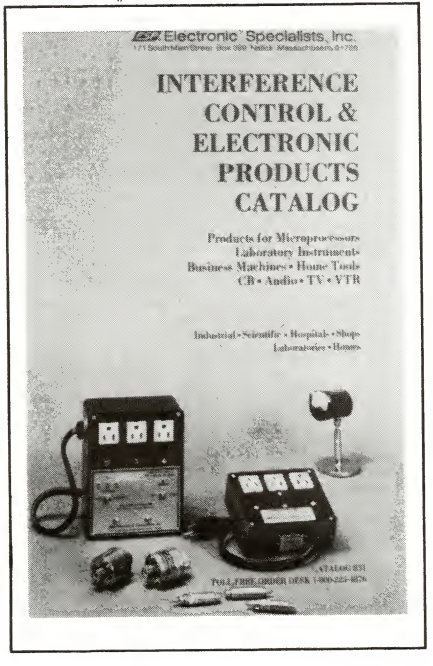
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This software will make a black and white copy of whatever you have on the screen. On the first run, the Screen Dump Utility creates the image on the printer and also makes a coded disk file of the operation. A second utility program prints directly from the disk file.

Previously written for Z-BASIC, the Screen Dump Utility is now also available in assembly language. In the assembly version, saving the screen image to disk takes less than 10 seconds. Speed of printing on the NEC 8023, M.P.I., Prowriter 8510, and Epson is about 90 seconds. The Infoscribe takes about 60 seconds.

The cost of the software is $39.95.

For further information, write to: Computer Place, Attn: Bruce Nevin, 115 Shorewood Dr., Menomie, WI 54751 (715/235-6043).

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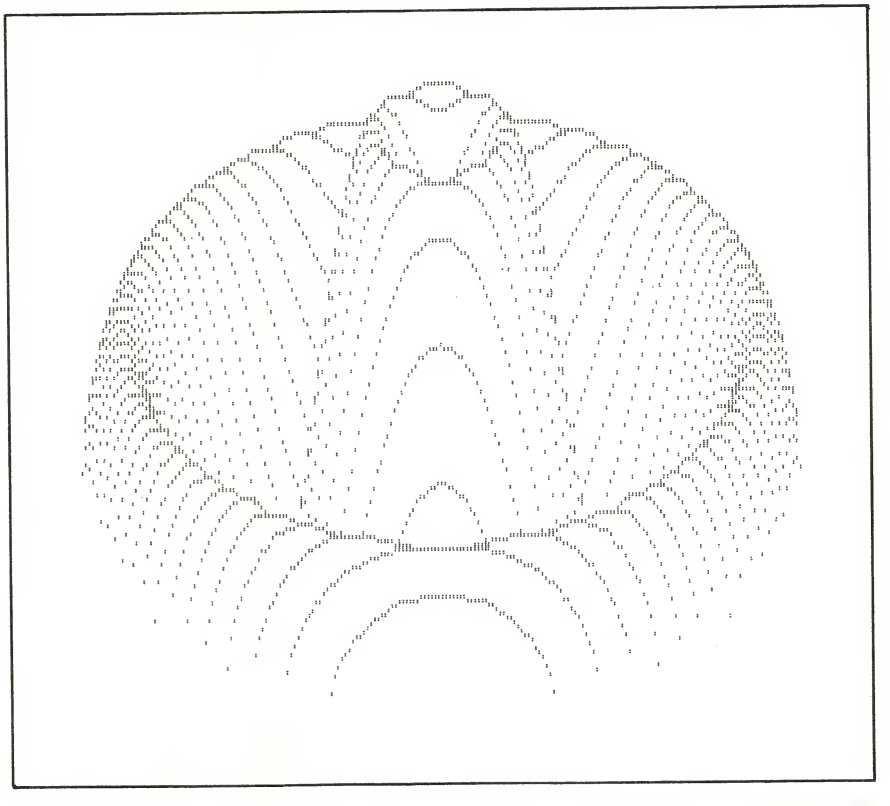

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HDOS SOFTWARE. Osborne's "Common BASIC Programs" and "Practical BASIC programs," $10 each. MBASIC or EBH (specify). Other disks available. Tom Bohon, P.O. Box 132, Knob Noster, MO 65336.

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Luminaries

Ralston W. Barnard works in software development for a nuclear geophysical project and uses his H11 at home to write personal finance software. He's active on CompuServe's MNET-11 Special Interest Group and is the librarian for the local Digital Equipment Computer Users' Society. When one keeps busy, one doesn't like poking in the same stuff over and over.

Edward A. Byrnes comes to computers by way of the Marine Corps, a degree in Philosophy, and an interest in writing: a suitably winding path for thinking up odd fortunes. His writing—and a picture—can also be found in *The Mother Earth News* #75, May-June 1982, p. 164.

Charles E. Cohn has a Ph.D. in Physics and is a physicist at the Argonne National Laboratory near Chicago. He's engaged in the design of computerized data acquisition and control systems for experimental nuclear reactors. (Hmm . . . does he use a single-drive '89 for that?)

Andy Dessler is a freshman at Rice University in Houston, Texas, with a proposed major in Physics. He didn't start out in programming, though, with programs like the one discussed in his article. He started out offering games, assembly language subroutines, and a mailing label program —four years ago.

William H. DuBay is editor of *The Arctic Policy Review* which is produced on his H8 — much as we use our '8 here at *Sextant*. He, however, can relax some of the rules we have here. In Washington's frequently stifling heat, we would have to point out solemnly that Kittie would more properly sleep atop the '19 *without* obstructing the air vents. In Anchorage, though, overheating equipment may be less of a problem.

Hal Glatzer is now an old hand at reviewing Magnolia Microsystems products. He took a look at the company as a whole in *Sextant* #3, Fall 1982 ("Putting the 'O' in "OEM": Magnolia Microsystems"). And their other add-ons are also discussed in his book, *How to Use: Zenith/Heath Computers.*

Joseph González has been accused of presiding over the Puerto Rico Heath Users' Group. Which goes to explain why he's one of the few *Sextant* authors to get his picture printed. (Even if we did have trouble typesetting all his accent marks!) By sheer accident, he was photographed at HUGCON 1, the first National Heath Users' Group Conference, in *Sextant* #4, Winter 1983 (on page 7, looking intent in a striped shirt).

James A. Ingram has already explained himself in his article. Now all he has to worry about is that copies of this issue of *Sextant* aren't surreptitiously distributed amongst the Broken Bow, Nebraska, high school's computer users.

Hugh Kenner, when not teaching or writing about James Joyce, English literature, et cetera, turns out his books on an H89. He also moonlights as a consultant to manufacturers and others coping with geodesic domes. (There — we've explained why a nice respectable English prof has gotten to be a hacker who worries about the mathematical precision provided by this language or that. Now, we've just got to explain the domes.)

Steven C. Noeller, from Las Vegas, Nevada, is an electronics technician in the Air Force. He admits that his main character contains "a little bit" of himself — but we forgot to ask whether he turned to cartooning when he couldn't get any time on his computer.

Kirk L. Thompson works as a mold setter in Iowa City, Iowa. He has to travel about four and a half hours, one way, to Omaha for the nearest Heath Users' Group meetings. (See "HUGs: Enjoyable Education" in *Sextant* #5, Spring 1983.) He writes regularly for the *OMAHUG Newsletter.* He's written for *Microcomputing;* and he has an academic interest in and writes on interdisciplinary studies. (Now you see why he tries to get more speed and convenience out of his computer.)

The Z29 Terminal

The Z19's successor positions Zenith for further growth in the terminals market.

Charles Floto

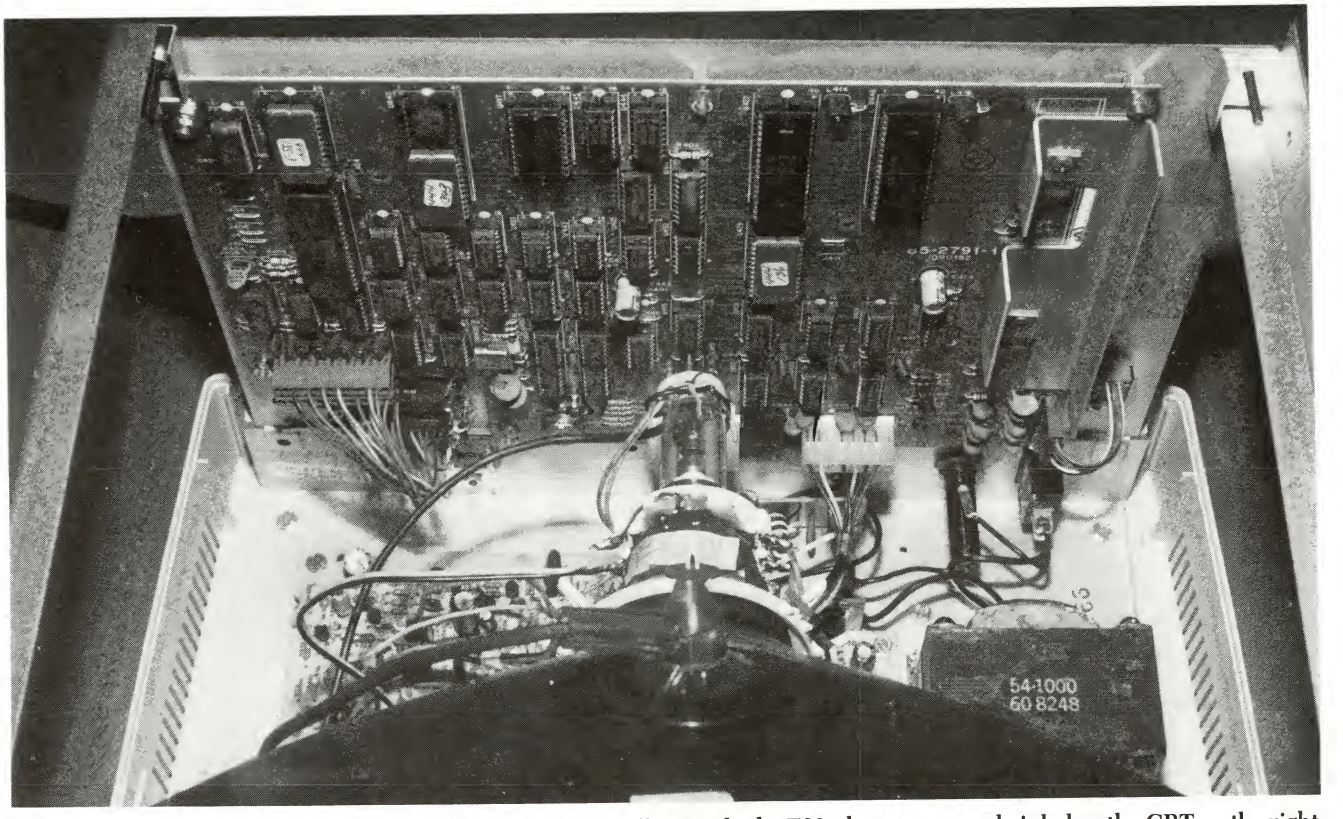

Photo by Charles Floto

Inside the Z29, the power supply is below the CRT on the right side of the chassis, with the video circuit board on the left side. The logic board is mounted to the rear panel. The two large chips at the upper right are 8276 CRT controllers — one to handle characters and one for attributes (blinking, underlined, half-intensity, reverse video). The two smaller chips along the board's upper edge are 2114s; they store the video attributes in RAM as 2K of 4-bit nibbles (one nibble for the four attributes of each character). Immediately left of this pair, a 6116 CMOS static RAM holds 2K bytes of display character information. Farther left, two 2732 EPROMs have paper labels covering the windows which permit erasure of the 4K bytes of control program each can hold. They serve the large black IC toward the left side, an 8031 microprocessor with on-chip UART to handle the Z29's communication. Future Z29s may have the 8031 replaced by an 8051. The latter holds 4K of ROM, so the substitution could free up the socket which is now partially filled by a 2732. Result: lower cost and more room for expansion (a modem, maybe?).

During the West Coast Computer Faire, *Sextant* staff members met quite a few people whose only previous contact with Zenith Data Systems had been their use of a Z19 computer terminal. (The Heathkit version appears on the cover of this issue.) The Z19 has been a major ZDS emissary to the rest of the computer world—sharing that distinction with the ZM-121 monochrome video display.

In order to maintain its success in the terminal marketplace, Zenith has introduced the Z29 as a successor to the Z19. It features a detached keyboard and a lower price tag—plus, I suspect, a higher profit margin at its suggested retail price of $849. (After all, it weighs only half as much!)

The Z29, when its keyboard is placed directly in front of the display, takes up a bit more space than the '19. The eight-foot telephone-style coiled cable easily allows the keyboard to be located as far as six feet from the monitor—from which distance few people could read the screen. The flexibility of configuration provided by a detached keyboard is a distinct advantage: you can pick the typing distance and viewing distance independently. Now you can even lean back in a rocking chair with the 3¾-pound keyboard in your lap for a relaxed conference session on the Heath Users' Group Bulletin Board. For even more flexibility, there's a metal foot which can be rotated down from the bottom of the monitor to raise its rear a couple of inches, thus tilting the screen forward.

The older Z19 can be set up to be compatible with the VT-52 terminal from Digital Equipment Corporation. Alternatively, it can generate and respond to transmissions sanctioned by the American National Standards Institute. The new Z29 retains these capabilities and adds modes emulating the Lear Siegler ADM 3A and Hazeltine 1500 terminals. The appendices dealing with these two new terminal emulation modes total only six pages, compared to the 44 pages devoted to the modes retained from the '19. This suggests that the ADM 3A and Hazeltine modes were included less for their power than for considerations of

Photo Courtesy of Zenith Data Systems

The Z29's numeric keypad features a comma as well as a minus sign. Despite the lack of arrows, the "2," "4," "6," and "8" can serve the same cursor control functions they have on the Z19. Four LEDs indicate power on, disabled keyboard, off-line terminal, and capital letters locked on. The last is necessary because the CAPS LOCK key doesn't latch down. The power indication is appropriate because the Z29 can be set to extinguish the screen display if it remains the same for 15 minutes.

marketing the Z29 as a replacement terminal. However, the new modes may come in handy when using the Z29 with CP/M software designed to cater to a lesser terminal.

How complicated is it to downshift the Z29 to emulate a Hazeltine or Lear Siegler terminal? Unlike the Z19, there are no internal switches to set, and you don't have to remember obscure key sequences. Simply press the SET UP key at the upper left corner of the keyboard. This activates the menu display on the bottom line of the monitor. Select menu C, which has item 2 labeled "MODE." Pressing the "2" key rotates four options: "ansi," "zenith," "adm 3a," and "haz 1500." Get the one you want on the display, hold down SHIFT, and press SET UP again. The new mode will persist until you select another one—even if you turn off the Z29. Other terminal options the values of which can be altered and stored from a Z29 menu include tab settings, communications parameters, and cursor type.

Each character on the Z29 screen can be displayed in reverse video (as on the Z19), at half intensity, blinking, or underlined — or in any of the 16 combinations of these attributes. With about 128 different characters available for simultaneous display, it's possible to fill the 2,000-character screen and have no two characters alike. For added variety, the rate of blinking can be altered in increments of 1/30 second under software control. The speed ranges from a flicker to an excruciatingly slow flash.

The Z29 keyboard is closer to that of the Z100 than to the Z19's. But there's neither a REPEAT nor a FAST REPEAT key. Instead, the Z29 has automatic key repeat—at a rate which accelerates as a key remains depressed. This makes the cursor control keys, in particular, a lot more fun.

All in all, a suitable successor to the Z19.

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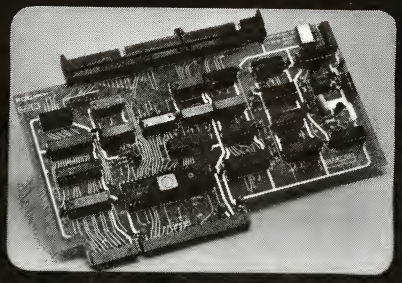

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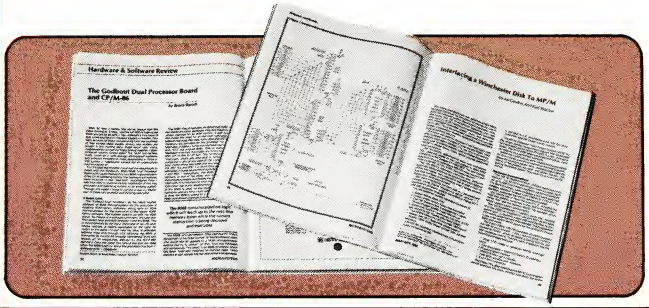

- A comparison of five popular S-100 disk controller cards.
- OS-1—a UNIX-like DOS with a CP/M adapter.

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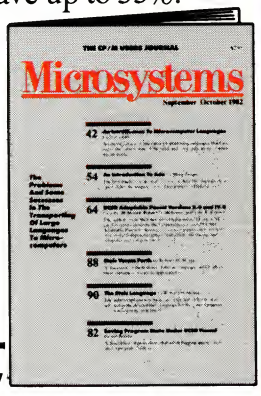

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NEW SUBSCRIBERS ONLY

Scuttlebutt

Zenith Data Systems has been bidding to sell Z100s to "dozens" of colleges and universities which are thinking of emulating Clarkson College by issuing a microcomputer to every student (at group discount prices).

During the past few months, we've been using a $5 editor for the Z100. Not a bad price, when you consider that even "bare-bones" editors frequently cost around $30, and top-of-the-line word processors can go for more than $300.

Software author Steve Robbins developed EDIT as an interim program for his own use—he's been developing a full-scale editor/word processor for the Z100. He announced EDIT's availability in the December 31, 1982 issue of *Buss: The Independent Newsletter of Heath Co. Computers*, and said, "I hope this editor will encourage others to produce Z-DOS software."

EDIT has three features which particularly appeal to *Sextant*'s editorial staff.
(1) It uses commands which are compatible with EDIT19, Steve's earlier editor for the H8 and '89, which we use on our H8.
(2) Very fast screen and text operations. EDIT paints the screen almost instantaneously.
(3) Word processing in color. EDIT can show various parts of the display in any of the Z100's seven colors. Technical Editor John Walker and Staff Writer Frederick Zimmerman agree that the best color for error messages is blood red.

EDIT has limitations, of course, since it's an interim product. It can't handle files larger than memory (57K), and doesn't have a "macro" facility, which would allow you to set up a complex series of commands of your own choosing.

But the most serious limitation is that EDIT comes with a limited software license which expires July 31, 1983. Presumably Steve doesn't want to compete with himself. He'd be going up against a tough competitor.

If you'd like further information about Steve Robbins' forthcoming full-scale editor, you can write him at 4610 Spotted Oak Woods, San Antonio, TX 78249, or you can call him at 512/492-3384.

A Clarkson College group called **Golden Knights Software** has written a word processor called **Galahad,** which will be issued with every Z100 at Clarkson. They plan to be selling the Z-DOS version this fall.

A Wall Streeter told us that just after Zenith Radio Corporation announced a loss for the last quarter of 1982 (caused in large part by a slump in the television market), Merrill Lynch's recommendation was **buy Zenith,** because "the worst is over" for ZRC's finances.

Are Zenith computers "the world's best kept secret?" Kelly Russell of the New Orleans Heath Users' Group thinks Zenith hasn't been doing enough advertising. He went to the local newsstand and purchased a supply of "research materials"—issues of ten popular business and microcomputing magazines. He found that Heathkit had "one (1)" ad in all those magazines—and an ad in *Byte* which "displayed an H89 and only mentioned the Z100 on the pull-out card."

"It seems a pity," Kelly observed, "that a company would invest good time and good money into fantastic computers such as the H/Z89 and the H/Z100 only to keep it the world's best secret. I started not to sign this letter," he said, "but someone had to say what almost everyone who has a Heath/Zenith is thinking." He concluded, "I love my Heath—and hope to be the owner of an H100 someday."

Frankly, we think Zenith has Tandy (**Isaac Asimov**) and Commodore (**William Shatner**) beat hands down in the science fiction celebrity sweepstakes. **Mr. and Mrs. Robert A. Heinlein** own two Z89s and *Byte* columnist and SF author **Jerry Pournelle** has been using a Z100.

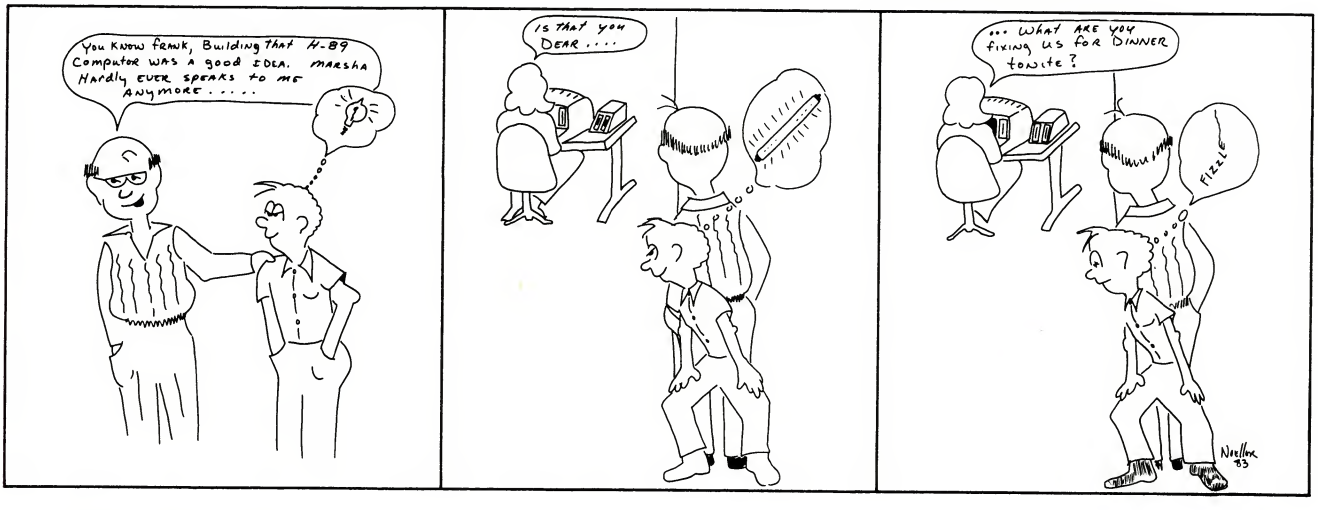
Incidentally, Pournelle told *Sextant* he's looking for Z100 software to review; if any independent software vendors would like to help him out, contact *Sextant*, and we'll pass the word.

Tom Shea, a senior writer for *InfoWorld*, wrote a piece on "Melen's Law," a **rating system for microcomputer hardware,** in the February 14 issue of that weekly tabloid of the microcomputing industry.
Melen's Law is based on three values:
R = (RAM capacity)/64K
C = (characters per display line x number of lines)/2000
D = (floppy disk capacity)/100K
The "M value" is computed using this formula:

M = R x C x D

The Z100 has 128K RAM, an 80 x 25 screen, and 640K capacity for an **M value of 12.8.** Not a single computer mentioned on the chart which accompanied the *InfoWorld* article scored higher than 10.0. That includes the Osborne I, the Apple II, the Hewlett-Packard HP125, the Sharp 3200, the Cromemco C10, the Apple III, the Xerox 820, the DEC Rainbow, and the IBM PC. What's more, the Z100's price is less than its three closest competitors. For some reason, however, the Z100 didn't get onto *InfoWorld's* chart.

Also in that February 14 *InfoWorld* (on the opposite page, in fact) Shea reported that members of Silicon Valley's original **Homebrew Computer Club** rank the Z100 as one of their two favorite computers over $2,000. Maybe the Homebrewers—whose early members included Steve Wozniak, designer of the Apple II, and Lee Felsenstein, chief engineer for Osborne Computer—know something *InfoWorld* doesn't.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